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MODERN MECHANIX

JANUARY

A FAWCETT PUBLICATION

MODERN MECHANIX 15¢

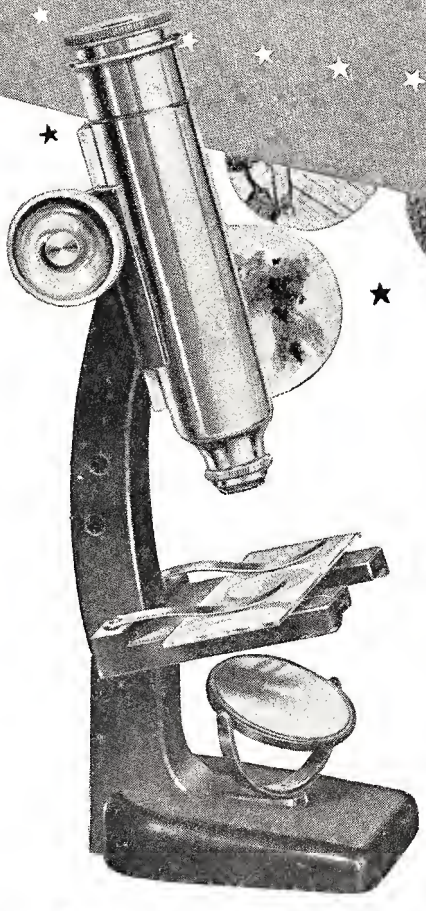
SEE PAGE 52

SCIENCE SAVES EYESIGHT

MODERN MECHANIX HOBBIES AND INVENTIONS 15 CENTS

A MICROSCOPE *for Christmas*

OPENS UP A LIFE-TIME OF EXPLORATION



The nature and science enthusiast who finds a microscope among his Christmas gifts, stands on the threshold of a life-time of thrills and excitement. For there are worlds yet to he explored—worlds whose mysteries can be fathomed only through the magic of the microscope. The pleasures of microscopy start with the first view of the unseen world, and continue through the years, each new discovery a stimulus to further exploration. But he sure the microscope you buy is a *precision* instrument—one which will give you the sharp clarity that the scientist properly demands from his equipment.

Bausch & Lomh microscopes are *precision* instruments —huilt hy the same skilled workmen who produce the famous Bausch & Lomb microscopes for medicine, science and research. Shown at left, Bausch & Lomb New Gem, 72 to 150 diameters, $14.50. Also, Model R, 72 to 300 diameters, with 455-page book, "Adventures with the Microscope," $21. Portable Microscope Lahoratory, $9.50. Micro-Projector, $18.50. Professional microscope models, $38 to $774.50. *Write for interesting free literature.*

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OPTICAL CO. 205 BAUSCH ST. ROCHESTER, N. Y.

What will you be doing — ONE YEAR FROM TODAY

THREE hundred and sixty-five days from now — what?

Will you still be struggling along in the same old job at the same old salary — worried about the future — never able to make both ends meet?

One year from today will you still be putting off your start toward success — thrilled with ambition one moment and then cold the next — delaying, waiting, fiddling away the precious hours that will never come again?

Don't do it, man — don't do it.

There is no greater tragedy in the world than that of a man who stays in the rut all his life, when with just a little effort he could advance.

Make up your mind today that you're going to train yourself to do some one thing well. Choose the work you like best in the list below, mark an X beside it, and, without cost or obligation, at least get the full story of what the I. C. S. can do for you.

INTERNATIONAL CORRESPONDENCE SCHOOLS

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★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X: ★

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☐ Building Estimating	☐ Telegraph Engineer	☐ Air Conditioning	☐ Chemistry
☐ Contractor and Builder	☐ Telephone Work ☐ Radio	☐ Steam Engineer	☐ Pharmacy
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MODERN MECHANIX

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1938

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Each month MM offers cash awards for the best pictures sent in by amateur photo fans. For full details see page 103.

NEXT MONTH

In addition to many interesting and novel workshop projects that will provide ample outlet for your skill with tools, readers will find many general features of an interesting and informative nature.

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The leaders of the next ten years will largely be determined in the next ten months. Will you be one of them?

Will You Be Clerk or Manager Ten Years from Now?

"SURELY, this could never happen to *me*," you say—"that I should be sitting at the same desk—be doing the same work—*for ten straight years!*"

But wait a minute—

Exactly that same thing has happened to thousands upon thousands of men. It has probably happened to men right in the company you now are working for. *And—unless you fit yourself for a better job—there is a very good chance that it may happen to you!*

Unthinkable? That's what J. N. Dixon of Columbus, Ohio, said to himself. Yet lack of training kept him slaving away at low wages for a long time.

TRIPLES INCOME

Here is Mr. Dixon's own story—"Just after I returned from the war, one of your representatives found me plugging away at a bookkeeper's job in Marietta, Ohio. He performed a real service and explained to me the need of further training, and induced me to take the LaSalle training in Higher Accountancy. After a few months of study, I secured a position with the Trust Department of a National Bank. This was the stepping stone I needed to various responsible positions including handling of receiverships and other important duties. That quickly boosted my income several hundred percent."

ANOTHER AMAZING SUCCESS STORY

If you think Mr. Dixon's success story unusual, please read what J. H. Krouse of Memphis, Tennessee, says. "When I decided to take your training in Higher Accountancy, I was a clerk. Today I am Chief Consultant Accountant for the U. S. Engineer's Office in Memphis, Tenn. Whatever success or recognition I have had, I owe to your training. I have had no other specialized training along this line. Your method of teaching is not only instructive but highly engaging. I have observed other courses, but firmly believe LaSalle has the best to be had anywhere."

Another bit of proof is Mr. R. P. Barthalow's experience. Mr. Barthalow is Chief of the Sales Tax Section of the Tax Commission of Ohio. A department which handles over $50,000,000 a year. Mr. Barthalow attributes much of his success to LaSalle training.

SEND FOR These Two Books and Start Toward Bigger Success

Need you hear more before you investigate the opportunities in Accountancy?

Or will you face the problem of your future NOW—and send to LaSalle and get further facts and particulars?

Without cost or obligation, the coupon will bring you two interesting books—one a 64-page book entitled, "Accountancy, the Profession that Pays"; the other "Ten Years' Promotion in One."

How about those next ten years—will you wait or will you START TODAY to realize the tremendous opportunities that lie ahead of you through sound and practical home-study business training?

Measure your grit and ambition by what you do with this coupon—NOW.

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Opportunities in Accountancy—Check below and we will send you a copy of "Accountancy, the Profession that Pays," also copy of "Ten Years' Promotion in One," all without obligation.

☐ **Higher Accountancy:** Leading to position as Auditor, Comptroller, Certified Public Accountant, Cost Accountant, etc.

Other LaSalle Opportunities: If more interested in one of the other fields of business indicated below, check that.

☐ Business Management	☐ Traffic Management	☐ Stenotypy
☐ Expert Bookkeeping	☐ Law: Degree of LL. B.	☐ Business English
☐ C. P. A. Coaching	☐ Industrial Management	☐ Commercial Law
☐ Modern Salesmanship	☐ Modern Business Correspondence	☐ Effective Speaking

Name _____

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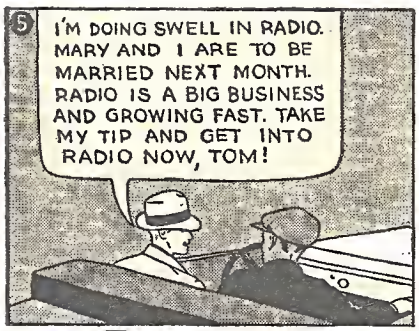
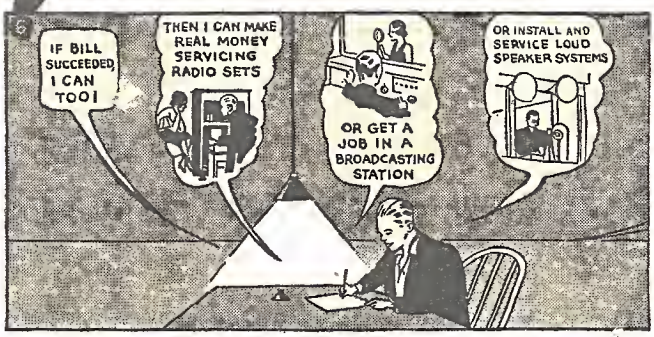
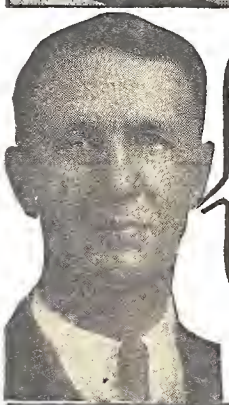
HOW A "TIP" GOT TOM A GOOD JOB

1
I HAVEN'T HAD A RAISE IN YEARS -- GUESS I NEVER WILL -- I'M READY TO GIVE UP
BUCK UP TOM, WHY NOT TRY AN INDUSTRY THAT'S GROWING -- WHERE THERE'S MORE OPPORTUNITY


5
I'M DOING SWELL IN RADIO. MARY AND I ARE TO BE MARRIED NEXT MONTH. RADIO IS A BIG BUSINESS AND GROWING FAST. TAKE MY TIP AND GET INTO RADIO NOW, TOM!


6
IF BILL SUCCEEDED, I CAN TOO!
THEN I CAN MAKE REAL MONEY SERVICING RADIO SETS
OR GET A JOB IN A BROADCASTING STATION
OR INSTALL AND SERVICE LOUD SPEAKER SYSTEMS



I will train YOU too at Home in Spare Time for Good Jobs in Radio

J. E. Smith, President, National Radio Institute Established 1914
He has directed the home study training of more men for the Radio Industry than any other man in America.

HERE'S PROOF THAT MY TRAINING PAYS

$80 Monthly in Spare Time

"I work on Radio part time, still holding my regular job. Since enrolling five years ago, I have averaged around $80 every month." JOHN B. MORISSETTE, 809 Valley Street, Manchester, N. H.

Makes $50 to $60 a Week

"I am making between $50 and $60 a week after all expenses are paid and I am getting all the Radio work I can take care of, thanks to N. R. I." H. W. SPANGLER, 126½ S. Gay St., Knoxville, Tenn.

Operates Public Address System

"I have a position with the Los Angeles Civil Service, operating the Public Address System in the City Hall Council. My salary is $170 a month." R. H. ROOD, R. 136, City Hall, Los Angeles, Calif.

Do you want to mak more money? Radio offers you many opportunities for well-paying spare time and full time jobs. You don't have to give up your present job, leave home or spend a lot of money to become a Radio Expert.

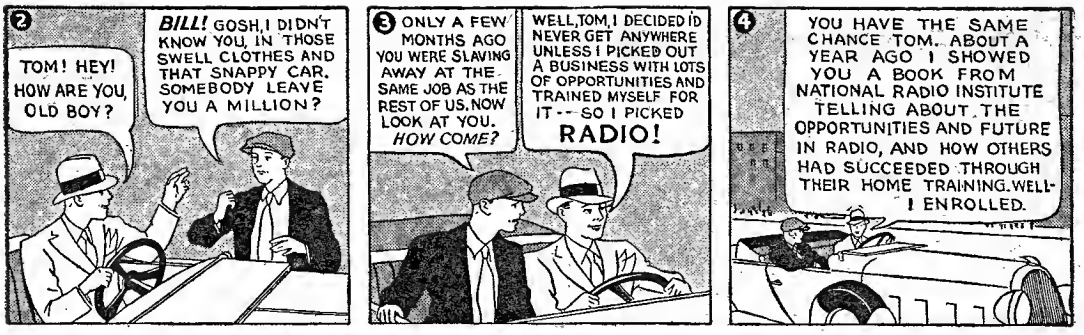
Many Radio Experts Make $30, $50, $75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as $30, $50, $75 a week Many Radio Experts operate their own full time or part time Radio sales and service businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Radio operators on ships get good pay, see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read their statements. Mail the coupon.

There's a Real Future in Radio for Well Trained Men

Radio already gives good jobs to more than 300,000 people. In 1936, Radio enjoyed one of its most prosperous years. More than $500,000,000 worth of sets, tubes and parts were sold—an increase of *more than 60%* over 1935. Over a million Auto Radios were sold, a big increase over 1935. 24,000,000 homes now have one or more Radio sets, and more than 4,000,000 autos are Radio equipped. Every year millions

Get Facts about THE TESTED


2
TOM! HEY! HOW ARE YOU, OLD BOY?
BILL! GOSH, I DIDN'T KNOW YOU IN THOSE SWELL CLOTHES AND THAT SNAPPY CAR. SOMEBODY LEAVE YOU A MILLION?
3
ONLY A FEW MONTHS AGO YOU WERE SLAVING AWAY AT THE SAME JOB AS THE REST OF US. NOW LOOK AT YOU.
HOW COME?
WELL, TOM, I DECIDED I'D NEVER GET ANYWHERE UNLESS I PICKED OUT A BUSINESS WITH LOTS OF OPPORTUNITIES AND TRAINED MYSELF FOR IT -- SO I PICKED RADIO!
4
YOU HAVE THE SAME CHANCE TOM. ABOUT A YEAR AGO I SHOWED YOU A BOOK FROM NATIONAL RADIO INSTITUTE TELLING ABOUT THE OPPORTUNITIES AND FUTURE IN RADIO, AND HOW OTHERS HAD SUCCEEDED THROUGH THEIR HOME TRAINING. WELL- I ENROLLED.

OR MAKE GOOD MONEY IN ANY ONE OF THE MANY OTHER NEW AND GROWING BRANCHES OF RADIO. I'M GOING TO SEND FOR THAT FREE BOOK RIGHT NOW!
7
YOU CERTAINLY KNOW RADIO. MINE NEVER SOUNDED BETTER
N.R.I. TRAINING CERTAINLY PAYS. I JUST STARTED A FEW MONTHS AGO AND I'M ALREADY MAKING GOOD MONEY IN MY SPARE TIME.
THANKS!
8
OH, TOM, IT'S WONDERFUL HOW FAST YOU'VE GONE AHEAD IN RADIO. WE NEVER COULD HAVE GOTTEN MARRIED ON WHAT YOU WERE GETTING BEFORE.
OUR WORRIES ARE OVER. I'M MAKING GOOD MONEY NOW, AND THERE'S A REAL FUTURE AHEAD FOR US IN RADIO.

of these sets go out of date and are replaced with newer models. More millions need servicing, new tubes, repairs, etc. A few hundred $30, $50, $75 a week jobs have grown to thousands in 20 years. And Radio is still a new industry—growing fast!

Many Make $5, $10, $15 a Week Extra In Spare Time While Learning

Almost every neighborhood needs a good spare time serviceman. The day you enroll I start sending Extra Money Job Sheets showing how to do Radio repair jobs. Throughout your training I send plans and ideas that made good spare time money for hundreds. I send Special Equipment to conduct experiments, build circuits, get practical experience. I GIVE YOU A COMPLETE, MODERN, PROFESSIONAL ALL WAVE, ALL PURPOSE RADIO SET SERVICING INSTRUMENT TO HELP SERVICE SETS QUICKER—SAVE TIME, MAKE MORE MONEY.

I Give You Practical Experience

My Course is not all book training. I send you special Radio equipment; show you how to conduct experiments, build circuits illustrating important principles used in modern Radio receivers, broadcast stations and loud speaker installations. I show you how to build testing apparatus for use in spare time work from this equipment. Read about this 50-50 method of training—how it makes learning at home interesting, quick, fascinating, practical. Mail coupon.

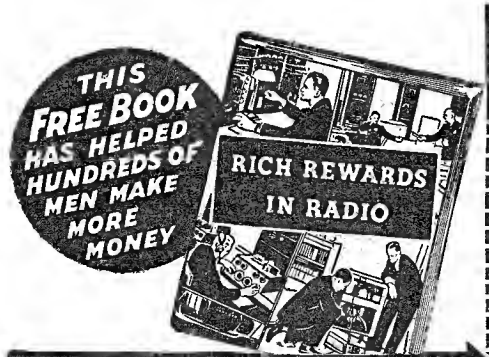
Money Back Agreement Protects You

I am sure I can train you successfully. I will agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish. I'll send a copy of this agreement with my Free Book.

Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL THE COUPON in an envelope, or paste it on a penny post card NOW!

J. E. SMITH, President
Dept. 8AH
National Radio Institute
Washington, D. C.



This Coupon is Good for One FREE Copy of My Book

J. E. SMITH, President, Dept. 8AH
National Radio Institute, Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

NAME..... AGE.....

ADDRESS .....

CITY..... STATE.....

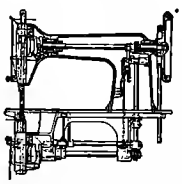
TO★INVENTORS

THIS is a message to inventors, for inventors, about inventors. If you yourself have an invention—even though it's only a crude idea in the back of your mind—READ ON. Read what other inventors have done—what steps they took—what steps you can take.

First remember this: that to be practical, useful, salable, and profitable, neither an invention nor the inventor need become *famous*. Most inventions and inventors are not. You know that Morse invented the telegraph; Edison the electric light; Bell the telephone. But who invented the eyelets in your shoes, the tips on the laces, the hook where you hang your coat, the hundreds of things you use from early morning until you go to bed at night?

In fact, the benefits you derive from the inventor do not even stop at night. You brush your teeth with a patented brush: with paste or powder from a patented tube or container; you wash in a patented basin; bathe in a patented tub; go to bed on a patented mattress, which in turn rests on patented springs.

Yet there is—always will be—room for improvement, progress, INVENTION. And for more INVENTORS! Today's "pipe dream" may become tomorrow's necessity. Most of the things people used even five years ago have been changed, improved, by new inventions. That is because inventors have been busy. Maybe it will pay you to get busy, too. Who can tell?

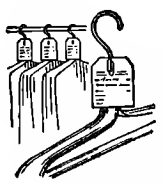


Double Stitch Sewing Machine

The Double Stitch Sewing Machine shown in diagram form at the left, is one of the patented inventions of Miss Beulah Louise Henry, famous as the leading woman inventor and generally known as "Lady Edison." With more than fifty patents to her credit, "Lady Edison" is still going ahead. The Double Stitch Sewing Machine shown here eliminates the bobbin, practically doubles speed of the average machine, permits use of smaller thread, and is less expensive to manufacture. Among her other inventions are a hair curler, vanity case, rubber sponge soap holder, dolls, toys and typewriter attachment.

Shaving Cream and Toothpaste Dispenser

Apparently Paul F. Roache, the inventor of this dispenser for shaving cream or toothpaste, was tired of having his shaving cream misplaced or of failing to find toothpaste ready for use at a busy moment. So he invented this dispenser to be attached to the wall of the bathroom. Patented certain features of same during 1937. The device first opens the collapsible tube and then discharges a desired amount of paste and automatically closes the container when released. Handy, indeed, especially when you are in a hurry.

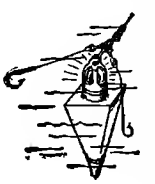


New Type Clothes Hanger

It is to be supposed that Richard D. Moore, who patented this new type clothes hanger in 1937, didn't like the ordinary wire or wooden hanger and decided to do something about it. So he developed and patented a new type hanger which can be made out of compressed paper and which also provides for an identification tag. The tag can be used for advertising purposes or for quickly locating a suit or dress of any patron in a dry cleaning establishment.

Lipstick Spreader and Remover

Another lady takes a hand at invention. Miss Esther M. Buttschau patented this little device to be carried in a woman's purse. The container holds small absorbent pads, to be used in place of handkerchiefs or tissue paper, for spreading and removing lipstick. Remove lid of container, push up the little feeder or knob at the bottom and up comes a pad. Lift off pad, use it on the lips and then discard.



Illuminated Sinker

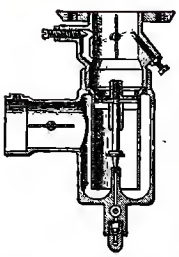
The fact that fish are attracted to light is no recent discovery. Illuminated fishing lures are not new. But James D. Watt decided he had a new and improved method of construction. The sinker contains a dry cell and small light bulb. When fish come "arunning" to the light, they're supposed to smell the bait and presto, they're hooked. There's just no telling where an inventor's mind will turn.

Accept No Substitutes! Always Insist on the Advertised Brand!

ABOUT INVENTORS

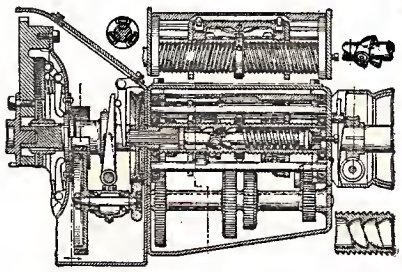
New Type Garter

Dr. Jeremiah Day, another inventor, believes in keeping his socks up evenly all around. The Y support for the garter attachment is designed to distribute pressure on the garter band evenly instead of at one or two points, thus preventing the sock from being up in front and down behind. The garter is also intended to insure greater comfort, and to prevent the possibility of interference with blood circulation. Why wear garters and then keep pulling up your socks?—so reasons this inventor.



Carbureter

Literally thousands of inventions relate to the operation of a gasoline motor. Here you see in phantom another idea for carburetor construction. The inventor's object is to provide a device to be employed either as an updraft type or a down-draft carburetor and a means to simultaneously control the air and fuel in accordance with the increased or decreased speed of the motor. The inventor in this case is Eugene H. Rustin.



Automatic Transmission

And here we illustrate what is commonly known as a complicated invention. This cross section showing the multiplicity of gears, drives, levers and shafts, serves to give only a crude idea of the mechanism involved in George L. Brown's conception of an automatic transmission. In cases of this character, the patent application frequently taxes the skill and knowledge of the patent attorney to the utmost. The cross section shown here is but one of several views embodied in the actual patent itself, granted by the Patent Office in 1937. It is said that today's automobile embodies the work of thousands of inventors. Certain it is that because of the spirit of inventive progress, the world has traveled a long way from the stage coach stage.

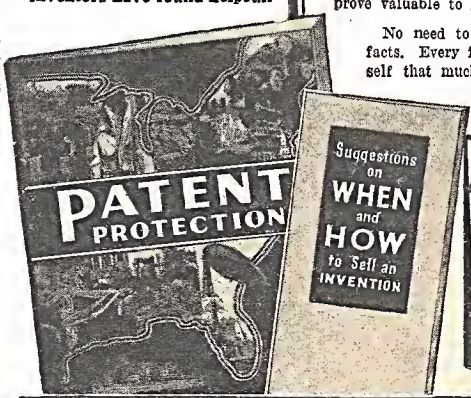
38 Years of Service To Inventors

It has been the privilege of this organization to serve inventors for 38 years. Today here in Washington we maintain a large staff of Registered Patent Attorneys, skilled draftsmen and experienced searchers to adequately represent our clients. Our fees are reasonable; deferred payments frequently arranged. If you have an invention, or have one in mind, your first step should be to secure information regarding Patent procedure. We have therefore in the booklets shown below, set forth many interesting facts and suggestions which other inventors have found helpful.

68 Pages Of Facts For Inventors

Send today for your copies of the two booklets "Patent Protection" and "When and How to Sell an Invention." These booklets will answer many questions regarding the simplest and most direct steps to take to apply for a U. S. Patent and likewise supply facts you should know before you attempt to sell or commercialize an invention. With the booklets comes an "Evidence of Invention" form on which you can quickly prepare a dated disclosure of your invention, a step which may prove valuable to you later on.

No need to delay. Know the facts. Every inventor owes himself that much. Sign and mail the coupon now.



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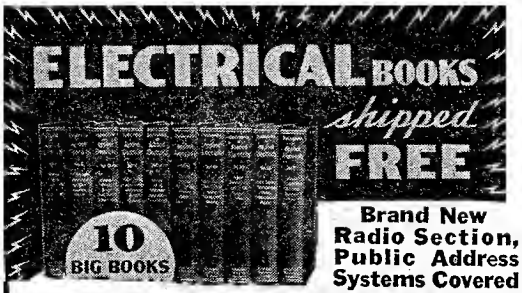

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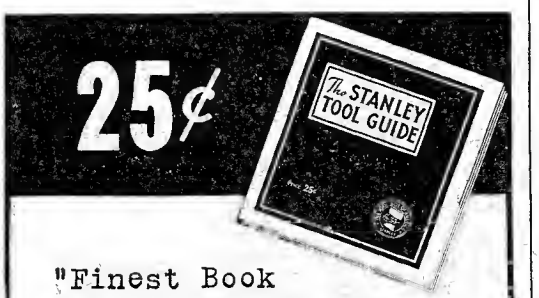

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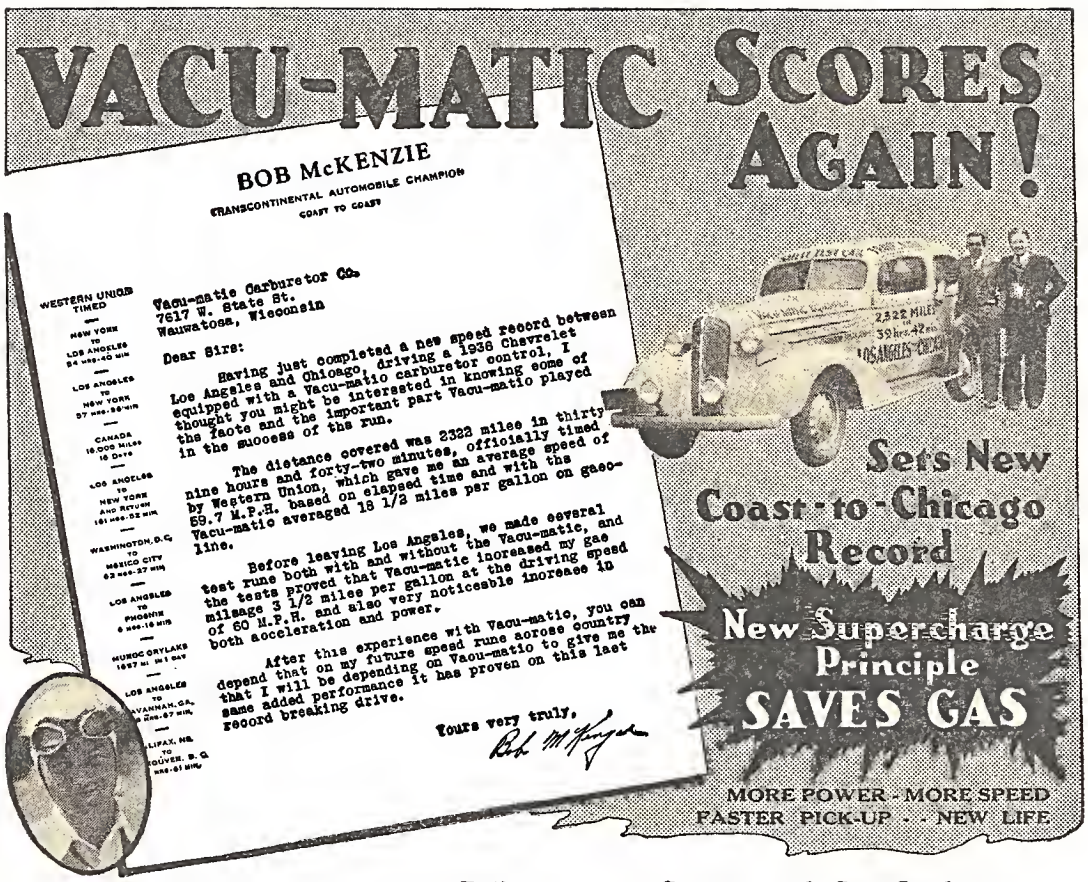
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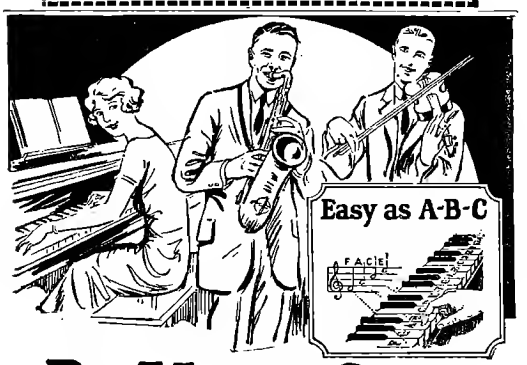
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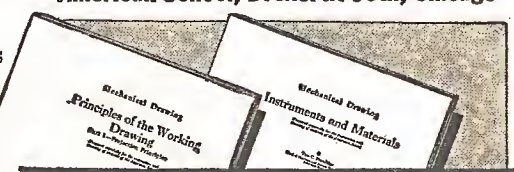

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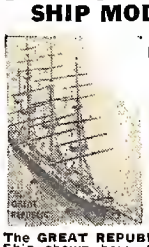

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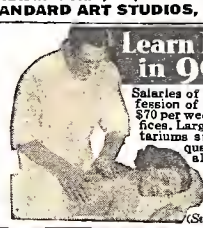

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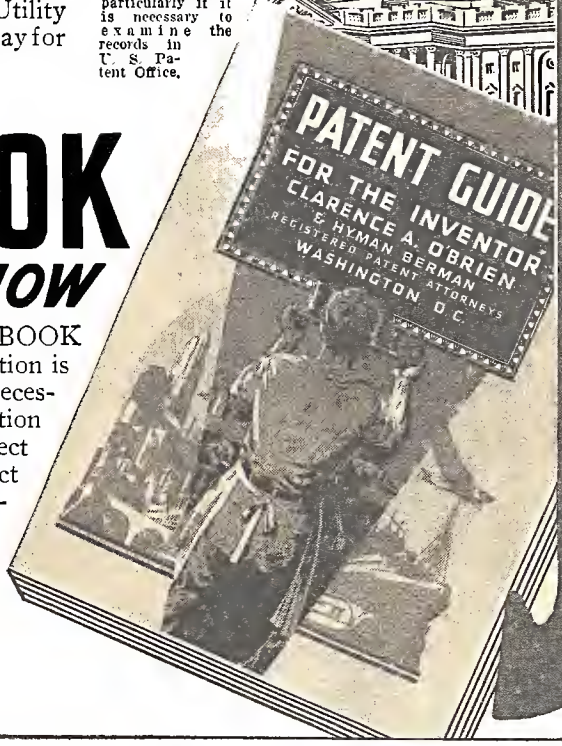

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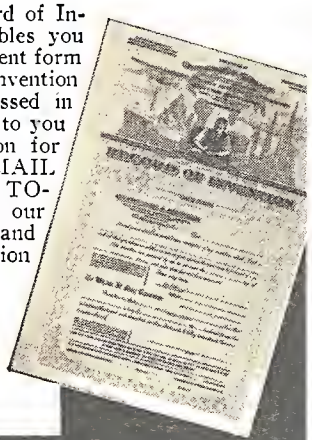

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ELIMINATING HUM IN RECEIVER

I have just completed a two-tube radio receiver and have been unable to eliminate the hum. What do you think causes it? Could it be the power supply?—William Brown, Detroit, Mich.

Yes, it could be the power supply, but if you have at least eight microfarads of filter condenser and a choke coil for filtering, the trouble is probably elsewhere. If the set uses a center tapped filament transformer, be sure the center tap is connected to ground. If the transformer is not center tapped and you are using a center-tapped resistor, try substituting another resistor or check its resistance on an ohmmeter. Be sure the chassis and cabinet are grounded. If you are not using a metal cabinet, the set may not be sufficiently shielded. Ground all transformer and choke cases and cores.

BECOMING A RADIO AMATEUR

I would like to become a radio amateur. Does the license cost anything?—Jack Blanchard, Los Angeles, Calif.

The United States Federal Communications Commission will grant you an amateur operator's license at no cost. The only requirement for obtaining this license is that you pass an examination designed to test your technical fitness for it. We suggest you read the article "So You Want To Become a 'Ham' " in the November, 1937, issue of MODERN MECHANIX.

FROSTY APPEARING GLASS

How can I give a frosty appearance to window glass?—Frank Brown, Norfolk, Va.

Cover the glass with a mixture of

Magnesium sulphate	6 ounces
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When the solution dries, the magnesium sulphate crystallizes into fine needles.

LISTENING TO SHORT WAVES

I have a receiver which tunes only on the broadcast band. What can I do to hear short waves?—E. J. Lister, Miami, Fla.

You could build or buy a short-wave converter which would make your present receiver capable of bringing in the stations you want to hear. However, you probably will get more service from a short-wave receiver designed for this purpose. You will find directions for building a receiver of this type in the December, 1937, issue of MODERN MECHANIX. A good short-wave receiver can be built as cheaply as a converter.

BLOWING FUSES

The fuses in my house circuit are always blowing out. Sometimes they last one or two days and other times, one or two weeks. Why should this happen?—William Ryan, Boston, Mass.

Probably the fuses are too small for the load on the line. When they last several weeks, it may be because the load has been just under their blowing point, and when one more appliance is connected, the load causes the fuse to blow. Before increasing the fuse size, you should have the wiring looked over by a competent electrician to be sure that a temporary short circuit is not causing the trouble.

REMOVING RUSTY SCREWS

I would like to remove some screws which have rusted in place. All attempts so far to get them out have ended in failure. How may I do it?—Walter Gustavson, Erie, Pa.

In almost every case, the following method will work. Place a small amount of light oil on the head of the screw and let it flow down into the threads. Heat a piece of iron, such as a poker, and touch it to the screw head. When the screw has become heated, it probably will come out easily. It is necessary to repeat the process for more stubborn cases.

REMOVING ALCOHOL STAINS

Recently I spilled some alcohol on a varnished table and large white stains appeared where it touched the surface. I have tried to remove them but so far nothing has been successful. What can I do to make these marks less apparent?—Robert Williams, Detroit, Mich.

Make a very thin paste of turpentine and pumice stone (000 grade), and with the fingers rub it over the stain. If progress is watched carefully, the stain will be removed and the surface will not be injured. Remember that if the alcohol has removed an appreciable amount of varnish, the only way to replace it is by refinishing the surface. However, this paste will usually remove the ugly stain so that casual inspection will not disclose the damage.

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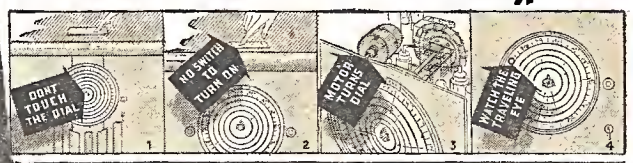

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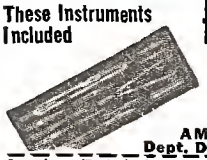

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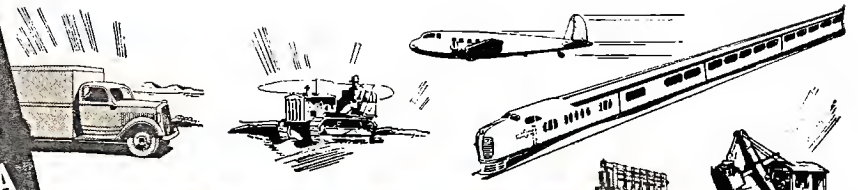

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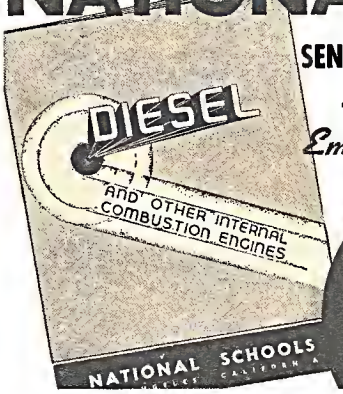

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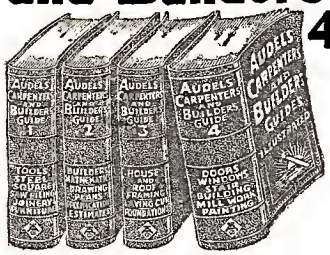

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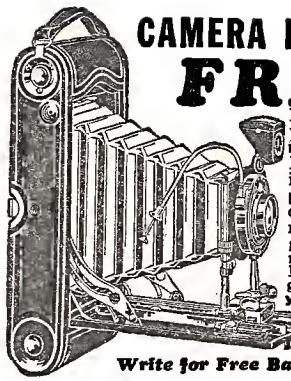

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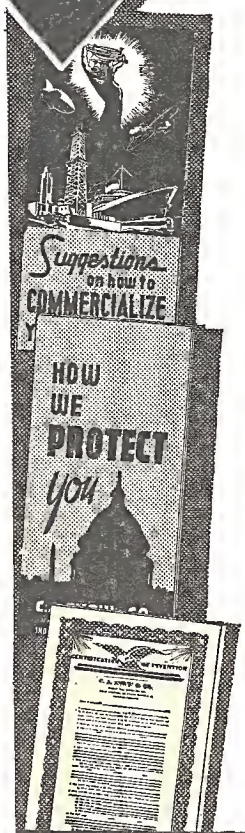

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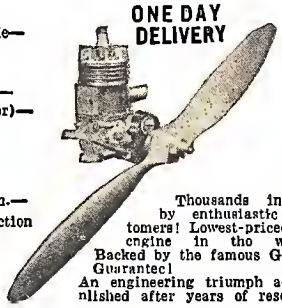

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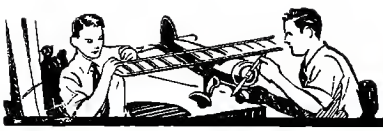

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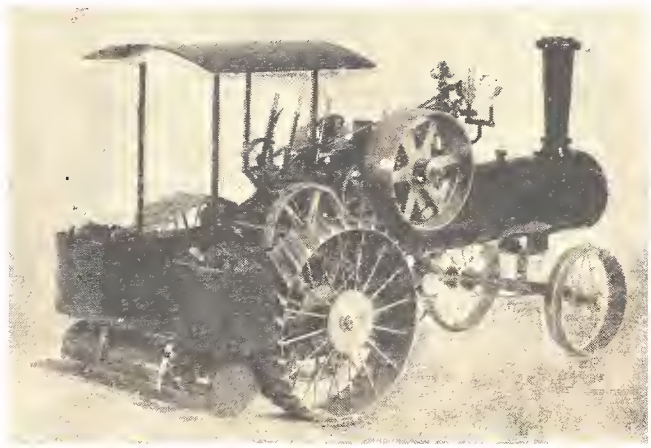


Evincing craftsmanship of highest quality, this model steam traction engine was constructed by Raymond Swanson. The whistle, steam gauge, governor, clutch, etc., actually work.

IT MAY be plenty cold outdoors, but judging from the amount of letters and photos received by the Workbench there is plenty of "heat", in the form of energy, being applied in thousands of home workshops maintained by MM readers. Keep up the good work, fellows, and don't stop sending in photos and details of your completed projects, as we are using as many as possible each month, awarding cash prizes for the photos used. Besides, you want to let other MM readers see the products of your craftsmanship, don't you?

* * *

Lloyd Moore, of Chariton, Iowa, was awarded this month's first prize of $5 for a letter and photo concerning a very novel project. His letter reads as follows:

Dear Editor:

I am sending you a photo of a model steam traction engine built by Raymond Swanson, of Humeston, Iowa. It is a working model, steam power being generated in a boiler with 18 flues by means of an alcohol torch.

The model is built to a scale of one inch equals one foot. The whistle, steam gauge, governor, clutch, throttle and reverse are all complete, working just as they do on a real steam traction engine.

Swanson did all the work by hand, using a small jeweler's lathe and a few other small tools. Construction of the model required over a year, working about five hours per day, and the total outlay for materials was about three and a half dollars.

Lloyd Moore.

The more we study the photo of Swanson's model, the more we are impressed with the craftsmanship it represents.

From Emanuel Forte, of Orange, N. J., came a letter and a photo that won an award of $3. He says:

Dear Editor:

Enclosed is a photo of my latest dirt track midget racer which is powered with a motorcycle engine. A multiple clutch and a three-speed transmission are used, enabling the car to attain a top speed of 82 m. p. h. The rear end is that of an old Model T Ford automobile.

I want to thank MM for numerous tips and kinks that helped me in constructing this racer. Shortly, I expect to build the Arlen Special racer that appeared in recent issues of your magazine.

Emanuel Forte.

Judging from the photo, Forte has turned out a very creditable job and we feel sure he will have no trouble in building the Arlen Special.

* * *

A prize of $3 was awarded to Clarence Downton, of Saskatoon, Canada, for his letter which reads:

Dear Editor:

I am sending you a photo of a snowplane that a friend, Dave Mitchell, and myself built in our spare time. How do you like it?

We have used this machine for a lot of winter traveling and on several occasions the Mounted Police have made use of it. The snowplane has also aided me in my garage business, proving to be an excellent adver-

Powered by a motorcycle engine, this midget dirt track racer can travel 82 m.p.h. Builder Emanuel Forte is at the wheel.

Editor's Workbench

tisement. I buy MM every month and like it because it does not publish the same thing two or three times like some magazines do.

Clarence Downton.

We like the photo of the snowplane very much, Downton, and if the Mounted Police used it, well—it must have "the goods."

* * *

Another $3 prize winner is Fred Kennedy, of Plant City, Florida, whose letter reads:

Dear Editor:

Enclosed is a photo of a tiny radio I constructed from plans that appeared in MM. I have added some features since the set was first constructed, among which are a band-spread tuner with a plug-in coil arrangement that provides range from 16-555 meters, and a one-tube amplifier.

I am 14 years old and get a lot of pleasure from short-wave radio, spending most of my evenings listening in. I wonder if you could give me any information on passing the amateur radio operator's examination?

Fred Kennedy.

Reader Kennedy and many other MM short-wave fans will find the article—"So You Want To Become a 'Ham'"—which appeared in the November issue of MM, to be of great help relative to the securing of an amateur radio operator's license.

Fred Kennedy built this short-wave radio set from MM plans. The photos show back and front view of the set.

* * *

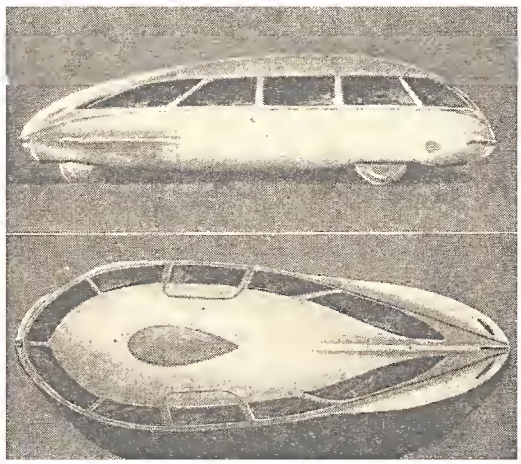
An award of $3 was sent to Melvin C. Mawhinney, of Cecil, Pa., whose letter reads as follows:

Dear Editor:

I have spent much time during the past few years in developing a design for an ideal "future car" and am enclosing a photo of a wooden model "Dream Car" that incorporates my design. I hope you will find it interesting enough to publish.

I hope to become a car designer some day and will soon have an interview with officials of an automobile company.

Melvin C. Mawhinney.



Shown in the above photos is a side and overhead view of Melvin C. Mawhinney's interesting model conception of ideal "car of the future." Note the perfect streamlining throughout.

We certainly hope that reader Mawhinney will have a profitable interview with the auto manufacturer and wish to compliment him on the unusual design of his model.

* * *

MM has received word of the organizing of an amateur inventors club in Long Beach, Calif., the purpose of which is to help amateurs protect and market their "brain children." Persons interested in the organization are invited to write to V. J. Schmidt, president of the club, at 3741 Gundry Ave., Long Beach, Calif.

* * *

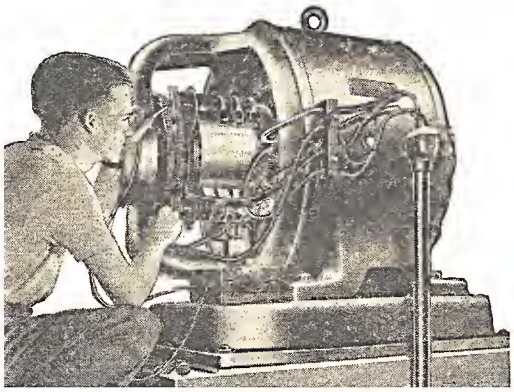
The snowsled season being at hand, many MM readers are enjoying themselves zipping over ice and snow in home-built power sleds constructed to MM plans. Lloyd Knoepke, of Helena, Mont., describes the snowsled he constructed in a letter which was awarded a $3 prize. He writes:

Dear Editor:

I am sending you a photo of my airsled. It is equipped with a four-cylinder motorcycle engine, weighs 210 pounds, and is 13 feet, 6 inches long.

[*Continued on page* 31]

Dave Mitchell and Clarence Downton, of Saskatoon, Canada, built this trim looking powered cabin snowplane. So well does it operate that the Mounted Police have used it occasionally.



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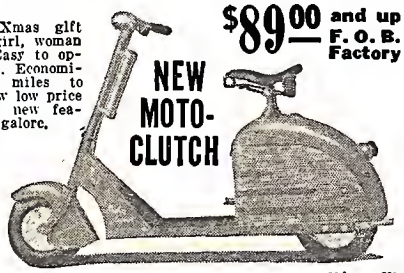

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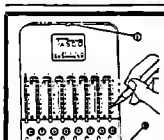

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Editor's Workbench Chips

[*Continued from page 29*]

Mounted on spring-set runners to insure easy riding over rough ice and powered by an old motorcycle engine, this air-sled carries builder Lloyd Knoepke one mile in 43 seconds.

I have made several types of snowsleds and find that this type gives the most thrills and speed. Springs on the runners insure easy riding over rough ice at all speeds. I have made a mile in 43 seconds with this sled.

Lloyd Knoepke.

Traveling a mile in 43 seconds is plenty of speed and Knoepke certainly must have thought his powered sled grew wings as it whizzed over the ice at that speed.

* * *

Apparently there is a growing interest in home-built aircraft, for we have been receiving more letters asking where parts, kits, and plans for building airplanes can be secured. We hope that all air minded readers read the article—"Are Home-Built Planes Safe?"—which appeared in the December issue of MM and that they will send in their ideas on the subject as well as photos of their home-built planes.

* * *

Another MM reader who wants to correspond with fellow hobbyists is Russell Coffin, of 14 Georgia Road, Thornton Heath, Surrey, England, whose letter reads:

Dear Editor:

As a reader of MM for some time I am wondering if you could put me in touch with American boys of my own age (16) who would like to correspond about hobbies.

I am interested in model railways, traffic control, and firearms. I will answer letters from any boys who are interested in these subjects.

Russell Coffin.

We are sure that many American hobbyists will want to contact this enthusiastic young Englishman.

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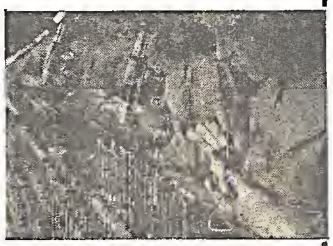

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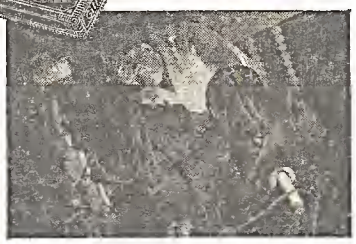

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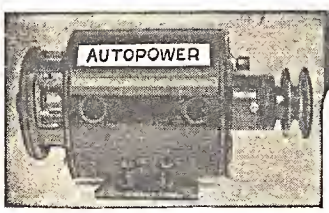

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Volume XIX
Number 3

MODERN MECHANIX

W. H. FAWCETT, Publisher

JANUARY
1938

SCIENCE SAVES EYESIGHT

by Donald G. Cooley

DOES it astonish you to be told that at this very moment, as you read these words, you are totally blind for a considerable part of the time it takes you to scan this sentence?

Science has proved that the human eye can see nothing while it is in motion. You read this line of type in four or five jumps, pausing at stopping-points to absorb a word or two, then passing on. As the eye moves from one fixation point to another you are quite blind, although you do not realize it because of the phenomenon of persistence of vision—the fortunate provision of nature which makes the movies possible.

For that matter, man is the only animal with an eye capable of reading or other close work. And there is only one tiny spot in the eye, called the macula, which can see things sharply. When you look at an object which you must see distinctly, you focus its light rays upon the macula. You can demonstrate this for yourself by focusing your vision on a word in the center of this line. It is clear and sharp. But the words on either side fade out to an indistinguishable gray blur.

When the examiner looks inside the human eye with an ophthalmoscope, this is what he sees if the eye is normal. The branch-like members are blood vessels of the retina. The nerve fibers from the retina converge upon the optic disc (the circular, rimmed area) and pass through back of eye into skull as the optic nerve.

By means of the ophthalmoscope, which illuminates the eye by a beam of light, doctors are able to study the interior of the living eye (above). The condition of the retina of the eye is an index to many types of disease.

The eye is such a complex precision instrument that in the entire human race there is probably no such thing as a physiologically perfect eye. Most eye defects are errors of refraction—some element of the eye is imperfectly shaped so that the organ cannot refract, or bend, the rays of light to focus them exactly on the retina. Years ago the old-time "eye doctor" used to prescribe spectacles in hit or miss fashion

by allowing his patient to try on various lenses from his sample case. When the customer found a lens which seemed to help him see better, the transaction was completed without any further tests. This "trial and error" method is part of the ancient history of the science of refraction. Today the refractionist uses delicate measuring devices which are among the most sensitive precision instruments known to any branch of science.

One such instrument, called Green's Refractor, is a complete optical miracle in itself. It is a complex instrument of dials, lenses and knobs which almost completely obscures the patient's face as he peers through it. To the uninitiated it looks like a monstrous mechanical mask suggestive of a Rube Goldberg invention. But this single mechanism is capable of making every examination required in refractive procedures.

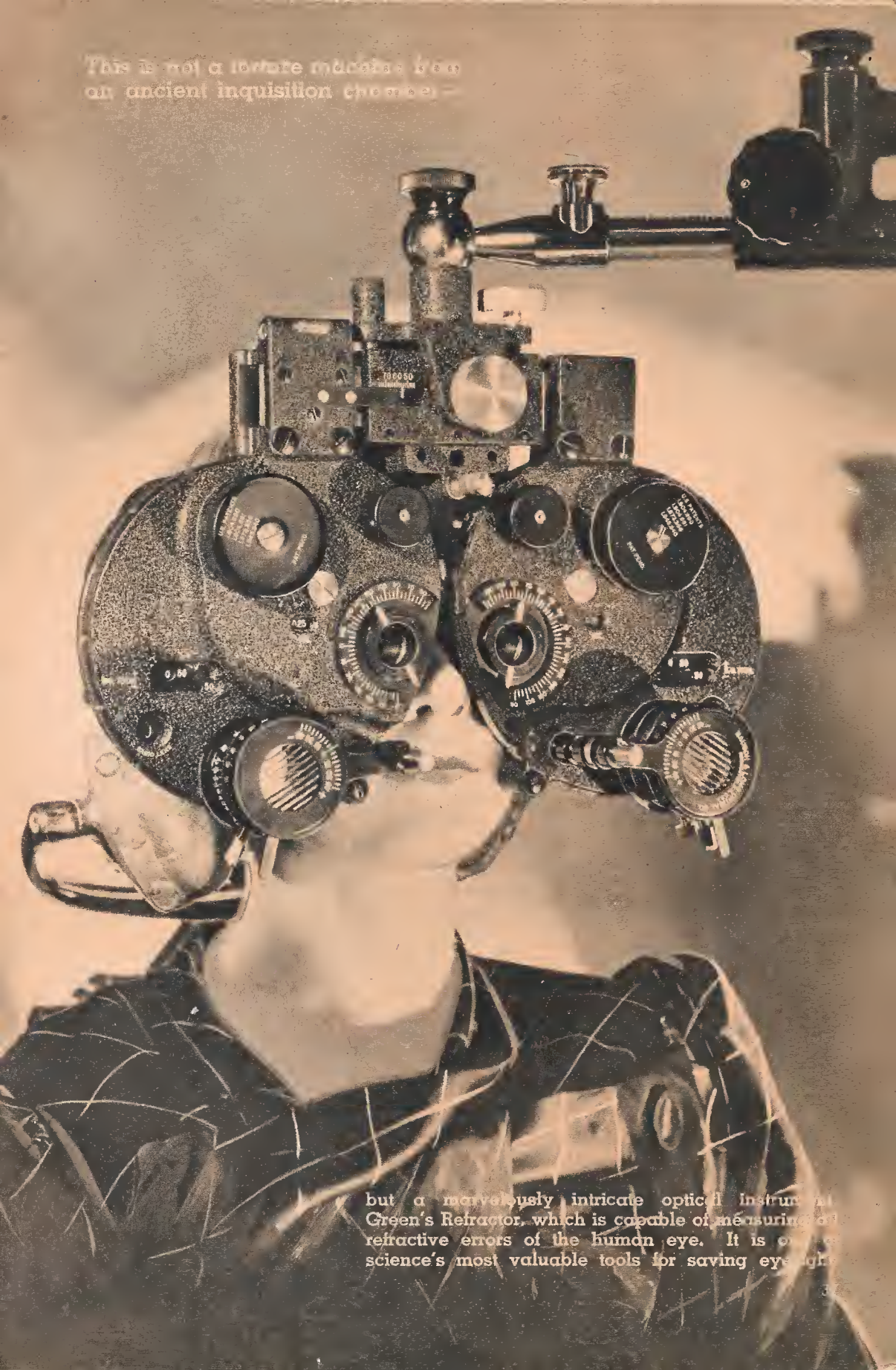
To understand this major miracle, some comprehension of the most common refractive errors of the eye is necessary. Your own eye is practically certain to be near-sighted, far-sighted, or astigmatic, although very possibly to such a slight degree that no optical correction is necessary. Near-sightedness is generally the result of an eyeball which is too long; the lens focuses light rays in front of the retina instead of upon it. It is corrected by concave lenses. In far-sightedness, the eyeball is too short and rays are focused behind the retina. The condition is corrected by convex lenses. Astigmatism results when the cornea—the transparent window at the very front of the eye—is curved unequally like the bulge of a teaspoon, instead of a mathematically correct spherical bulge. Compound lenses with unlike curves in different meridians compensate for this anomaly.

Sounds pretty complicated, doesn't it? Especially when you consider that two or more refractive deviations are usually found in the same eye. If you operate a camera, you know how critical a matter it is to focus your subject sharply. The slightest miscalculation gives a fuzzy negative. It's the same with the eye, except that spectacle lenses must be figured with infinitely greater precision. Many of the lenses used in refractive instruments are ground to an accuracy of a fraction of a wavelength of light—and if men were as wide as a wavelength of light, 3,000,000 of them could stand side by side on the edge of a foot rule.

Astigmatism produces more discomfort than any other refractive shortcomings of the eye. If you are astigmatic, you are unable to see horizontal and vertical lines with equal sharpness at the same time. If the vertical mesh of a screen door is distinct, the horizontal lines are hazy. It used to be thought that

—Photos courtesy Bausch & Lomb Optical Co.

An important aid in the diagnosis of brain tumor, kidney disease, anemia and various blood diseases, this instrument, the binocular ophthalmoscope, shows the eye background in stereoscopic depth, magnified 16 times.


This is not a torture machine from
an ancient inquisition chamber—
but a marvelously intricate optical instrument
Green's Refractor, which is capable of measuring
refractive errors of the human eye. It is one
science's most valuable tools for saving eyesight

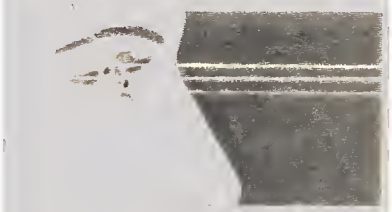
the cause of astigmatism was a displacement or tilt of the crystalline lens of the eye. Now it is known that the general cause of astigmatism is a malformation of the cornea.

To measure the cornea curvature, the refractionist uses an instrument called the keratometer or ophthalmometer. It consists essentially of a target which is imaged on the cornea, and a telescope through which the examiner observes the image. The patient looks through an aperture in the center of the target and fixes his vision on an image of his own eye. Light is projected from the target to the patient's cornea; from there the light rays pass through a series of lenses to form a magnified image which the examiner measures. Readings on the dials of the ophthalmometer give the proper figures for the corrective lens needed by the patient.

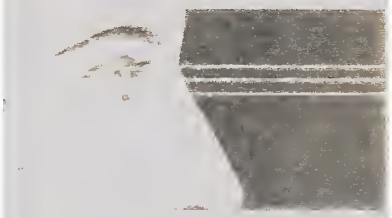
Astigmatism is also measured subjectively by having the patient look at charts until a corrective lens is found which makes both the horizontal and vertical lines on the test card appear equally sharp.

A trial frame, which is a spectacle frame in which test lenses can be placed and removed quickly, is also used in testing astigmatism, as well as near-sightedness and far-sightedness. In Green's Refractor, mentioned above, trial lenses are not used. The operator obtains lens powers of different combinations by manipulating the proper dials of the instrument, and when he is through he simply reads the correct prescription from the engraved figures which appear in windows alongside the dials.

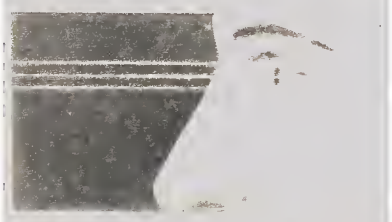
Like a camera the eye has its (a) lens; (b) film, the retina; (c) diaphragm; and (d) shutter, the eyelid. The eye focuses by changing its lens shape.



When the eyeball is too short, or the front of the eye (the cornea) is not sufficiently curved, rays of light come to a focus behind the retina.



To correct this condition, a convex spectacle lens is worn before the farsighted eye to bring the light rays to a sharp focus on the retina.



If the eyeball is too long, or if the cornea is too strongly curved, images of distant objects are brought to focus in front of the retina.

Near-sightedness is corrected by a concave lens, which bends the light rays and brings them to a focus on the retina.

Astigmatism, the inability of the eye to see both horizontal and vertical lines with equal sharpness at the same time, is corrected by a cylindrical or toric lens.

If an additional check on lens power is desired, the examiner may usher you to a seat alongside his Ferree-Rand Projector. This instrument, which is something like a specialized magic lantern, projects the symbols of a test chart on a screen. If you have ever stood in a thick forest at nightfall you know how darkness creeps up until you are finally unable to see anything at all. The point where you are just able to distinguish detail, before darkness blots everything out, is your threshold of vision. The eye is most sensitive to changes when working at this threshold.

Taking advantage of this principle, the operator of the projector dims the machine until you can just distinguish the test characters on the screen. Then, with his test lenses, he will strengthen or weaken your spectacle prescription very slightly. This tiny change in lens power will either improve your visual acuity considerably, or blur out detail entirely, thus enabling him to choose the proper lens for your eyes with extreme accuracy.

An instrument which the refractionist may use instead of the usual test cards hanging on a wall is the Clason Acuity Meter. This projects the familiar test symbols on a screen, varying their size rather than the strength of illumination. A sliding lever enables the operator to enlarge the symbols on the screen from invisibility to any desired size. The

How widely—not how far—can you see? The Ferree-Rand Perimeter (above) charts your field of vision. Ooe eye is tested at a time, a mask covering the other. While the patient fixes her vision on a fixation point, the operator moves a test card along the semi-circular frame uotil it becomes visible to the patient, the point of visibility markiog one limit of the visual field. The slit-lamp, or biomicroscope (below), enables a surgeon to determine just how deeply a foreign object, like a cinder, lies in the structure of the eye.

patient cannot memorize the symbols and give misleading answers, as sometimes happens when charts are used, for the examiner begins with symbols too small to be distinguished, and stops enlarging them at the exact point where the patient can read them.

The invention of the ophthalmoscope by Helmholtz in 1851 really marked the beginning of the science of physiological optics. Students had a'ways wanted to see into the interior of the living eye, but this was generally believed to be impossible as it was thought that all light shining into the eye was completely absorbed. The ophthalmoscope of Helmholtz proved that when a beam of light is projected into the eye, the deeper parts can be made visible if the examiner looks along the line of the beam.

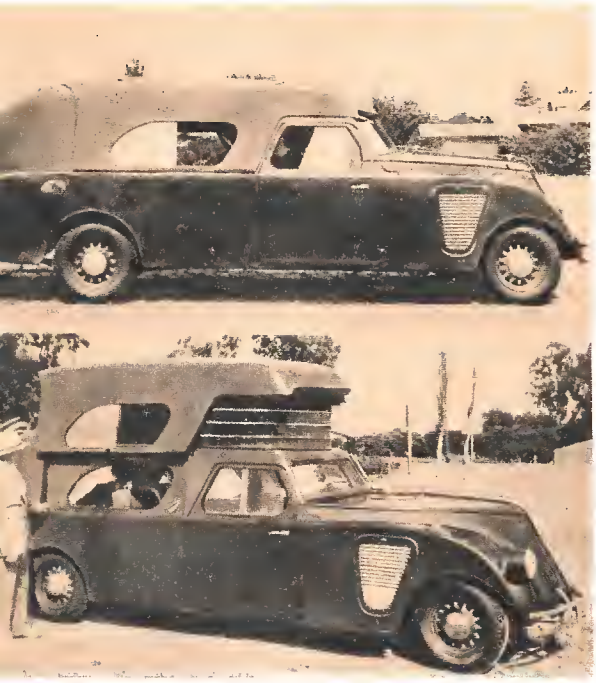
Essentially, the ophthalmoscope is a hand instrument which generates light from a bulb in the handle and projects it from a mirror into the eye, the examiner peering through a pinhole behind the center of the mirror. To him the pupil then appears red instead of black; what he sees is the retina or background of the eye with its network of nerves and blood vessels. The eye background is technically called the fundus and it looks like an orange disc, with red blood vessels. (See illustration, page 35)

The retina is perhaps the most marvelous sense organ of the body. It is the light-sensitive curtain at the back of the eye which transmits images formed upon it to the brain via the optic nerve. Thinner than a sheet of onionskin, microphotographs reveal that the retina consists of ten layers The deepest layer is made up of rods and cones (so named from their appearance) which in some mysterious way seem responsible for the chemistry of vision. In each eye there are some 130,000,000 rods and cones—one for each man, woman and child in the United States.

Actually the retina is an extension of brain tissue. It is, in fact, the only spot in

[*Continued on page* 118]

Auto-Home Developed



The roof of this streamlined auto (top) features a cleverly concealed magazine bed that furnishes the "bedroom" created when the roof is raised, as shown in lower photograph.

A STREAMLINED auto sedan that converts into a two-story dwelling with all the comforts of home has been developed by Arthur S. Thompson, a watchmaker in Ontario, California. The car is of standard width and has a wheel base of 138 inches, but the body design features a special roof that becomes a comfortable two-person bedroom when raised. A magazine-type bed is cleverly concealed in the roof when it is lowered for traveling.

The four upholstered chairs in the lower section of the novel auto can also be converted into a bed for two persons, thus providing the car with sleeping facilities for four. Fresh air is assured by a special ventilation system. The rear of the auto boasts a refrigerator, a sink with running water and space for supplies.

New Synthetic Ice Invented

A PATENT covering the manufacture of synthetic ice for use in skating rinks has been granted by the U. S. Patent Office to two Czechoslovakian inventors, E. Murmann and C. Prell. The "ice" features the use of naphthalene—main constituent of mothballs—and certain chemicals obtained from coal tar.

Literally a product of the chemist's test tube, the synthetic ice has the following advantages:

No water to freeze or melt. No elaborate refrigerator machinery with intricate coils or pipes is needed. Warm spells may come and go, but they will not melt the artificial ice, it is claimed by the inventors.

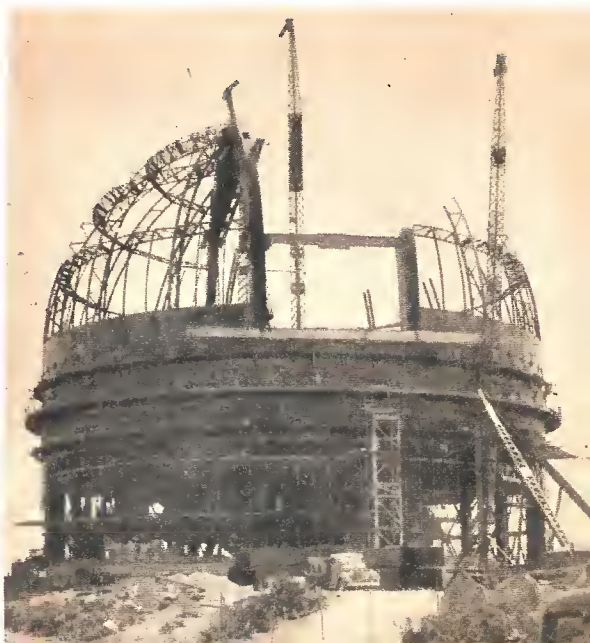
The chemical ingredients for making the ice are melted together with hard synthetic waxes, forming a fused mixture which may be poured in any desired thickness on the area which is to be converted into a skating rink. As the mass cools and hardens, the tar chemicals separate out as microscopically small crystals. These crystals keep the rink from cracking and forming fissues that would trip skaters. After the artificial ice has set, the surface is smoothed by scraping and ironing with hot irons.

Mt. Palomar Observatory Nears Completion

THE world's largest astronomical observatory is rapidly nearing completion atop Mt. Palomar in California. The steel beams constituting the framework of the 140-foot observatory dome, each of which weighs 10 tons, have been rigged into place by huge derricks and the dome will soon be covered with metal sheeting.

When completed, the observatory will feature a 200-inch telescope, the largest ever made. Mt. Palomar was chosen as the site for the giant telescope because of the superior visibility and freedom from fogs it provides.

Standing 138 feet high and 140 feet wide, this astronomical observatory atop Mt. Palomar, Calif., nears completion.



Dutch Test Double-Decke

CITY planners in Rotterdam, Holland, have achieved a workable solution for the problem of facilitating and protecting pedestrian traffic through the construction of double-decker streets. Developed as an experiment, the three miles of test streets have proved so practical and popular that city authorities are planning to construct more of them in the future.

The double-decker streets are two stories above ground level, being supported by attachment to apartment houses along the right-of-way. Bicycles, baby carriages and hand-pushed delivery carts are the only vehicles permitted to use the new streets, thus providing a safe "highway" for pedestrians and children. Pedestrians and vehicles are raised to the street level in small elevators.

Double-decker streets like this one are being tested in Rotterdam, Holland. Two stories above ground level, the novel streets are supported by attachment to nearby buildings.

Cellophane Used For Sail

Lola Barry, of Flushing, N. Y., displays scale model yacht she constructed. Craft is fitted with sails made of Cellophane.

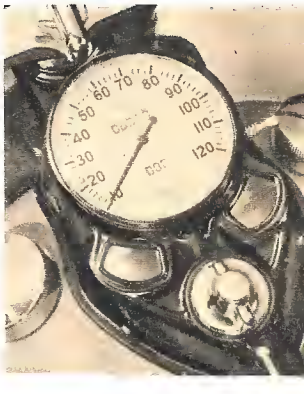
ENTERED in a model yacht regatta staged in New York City recently, a boat constructed by Lola Barry, of Flushing, N. Y., featured sails made of Cellophane. The transparent material is said to be well adapted for model yacht use, providing sails that are lighter and stronger than those made from cloth or other fabrics.

Models Show Cell Structure

ARTIFICIAL models of living cell membranes are now being used by scientists to detect the facts of cell structure. The models are prepared by spreading simultaneously proteins in the form of egg albumin and fatty acids on water surfaces. The resultant film is then tested for strength, inhomogenities in the surface being detected and studied with an ultramicroscope.

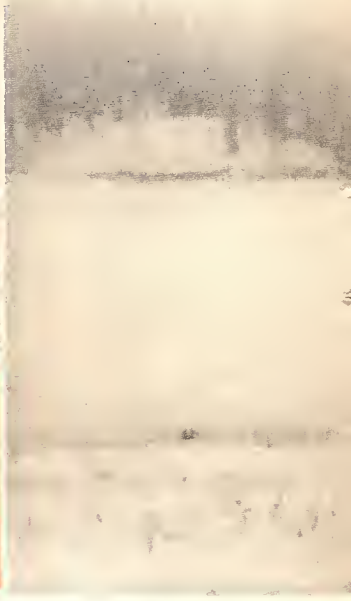
Lights Reveal Motor Trouble

THE instrument panel of a motorcycle produced by a well-known manufacturer features red and green signal lights that serve to inform the driver whether or not the generator and the oil system are functioning properly. When the ignition switch is turned on the red light flashes to indicate improper oil pressure, remaining lit until pressure is normal. The green light remains lit until the generator charges properly. The lights, which are built-in as part of the classy instrument panel, flash brightly enough to attract the driver's attention even in daylight.



RADIUM

Since 1931 the mining camp at Great Bear Lake has grown from the few buildings shown above to a substantial community with a bank, stores, etc. The piled-up drums contain fuel for prospectors' planes, main transportation means.



On the shore of Great Bear Lake near the Arctic Circle, a load of pitchblende (right), the ore that contains radium, awaits shipment by plane and train to the refinery at Port Hope, Ontario, more than 3,000 miles away, where the mineral is chemically extracted from the ore in batteries of retorts (above). It requires 20 tons of chemicals and 6½ tons of pitchblende to yield one gram of radium valued at $30,000!

WHEN prospector Gilbert LaBine flew over Great Bear Lake in northern Canada and saw strange dark seams in the rocky shore just below the Arctic Circle, he little realized that six years later he would produce the first ounce of North American mined radium, that his aerial view of rocky Great Bear Lake coast meant the breaking of the Belgian Congo radium monopoly with a resultant cutting of price from $2,000,000 an ounce to $840,000.

Today on the shores of remote Great Bear Lake there are many mining camps, some already in production, others in initial stages, and farther afield prospectors are still staking claims. A rush followed LaBine's discovery in 1930. He went in by plane and dog team during the spring to explore the dark seams he had seen from the air. He battled the last of the Arctic blizzards, crossed treacherous spring ice on the 12,000 square mile lake, and made for the bay where he had seen the peculiar rock markings. There he found pitchblende, the ore which contains radium and its associated minerals, as well as silver, copper and some gold. But other metals were forgotten in the possibilities of radium, the little known mineral which sells by the gram, 28 grams making an ounce, the mineral which has been found to be one of the most likely cures for cancer, one of the scarcest and most valuable minerals on earth.

The assays proved the pitchblende was rich in radium, and extremely rich in silver.

From The Arctic

by James Montagnes

Stirring acids into pitchblende to start radium extracting process (above). Note the rubber gloves worn by the laboratory worker to avoid burns.

Frozen, or free of ice, Great Bear Lake (above) provides an excellent landing area for the planes of prospectors who work the valuable radium ore claims.

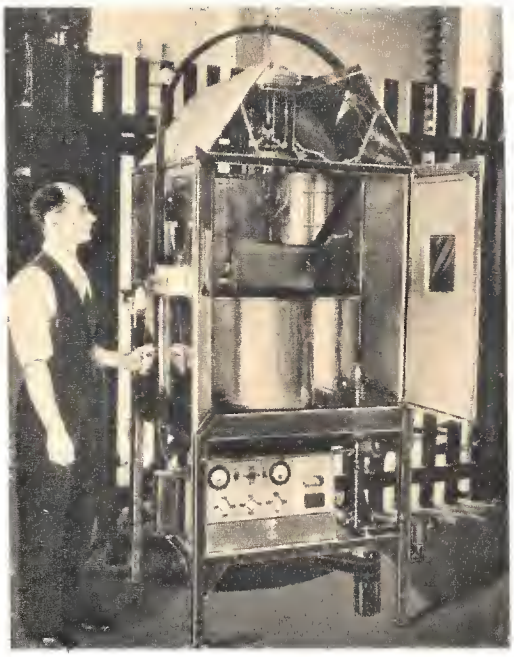
Left—Chemical extraction of the first ounce of radium from Great Bear Lake ore is eagerly watched by Gilbert LaBine (extreme left), discoverer of the mines, and a group of friends. Above—"Cooking" pitchblende with chemicals to extract radium used in cancer treatments.

LaBine, his brother, and several other prospectors staked five miles of Great Bear Lake shore. Their vein ran nearly all the way. And though they were a thousand miles from the nearest railway, though water transportation did not exist, though only planes or dog teams could get in, LaBine and his brother financed their find, started a rush.

They shipped out bags of the black ore, dangerous to handle because of the radium content. By plane, by tractor and by scow, they hauled mining machinery from the nearest railway—more than one thousand miles away. At Port Hope, Ontario, they established a refinery and procured the best man available to extract the radium from the ore, Marcel Pochon, who had done work for the Canadian government's research laboratories. And while they tunneled on Great

[*Continued on page* 120]

Device Reproduces Weather Within Metal Cabinet



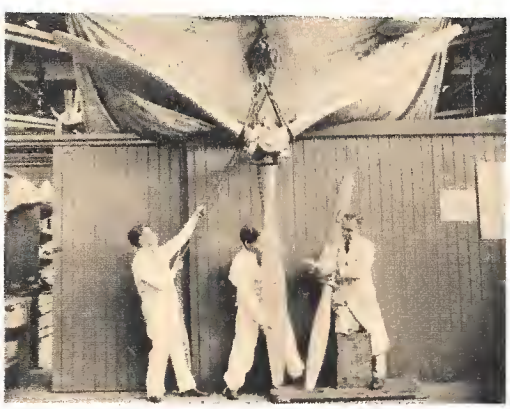
Designed for testing various materials, this "weatherometer" device can duplicate any weather condition such as rain, fog, desert heat, etc., by the mere turning of control knobs.

KNOWN as a "weatherometer," a newly invented device enables the operator to create any weather condition within the confines of a steel cabinet by merely turning a few knobs and switches. Electrically controlled, the weatherometer can quickly create a miniature San Francisco fog, a Kansas rainstorm, or the blistering heat of the Mojave desert for testing electrical insulation, durability of paint, etc.

The unusual device is mounted on a four-legged stand on the bottom part of which is mounted the control panel with its knobs, switches, and test meters. The upper part of the stand features the test cylinder chamber and a door that permits materials to be placed in the cylinder. A glass window in the door is used for observation.

Build Biggest Aero Propeller

DESIGNED for use on engines of 1,700 horsepower, which are said to be in process of construction at this time, a huge three-bladed propeller built by the De Havilland Aircraft Co., of England, measures 14 feet, 6 inches in diameter. The propeller features controllable pitch and is claimed to be the largest of its type ever constructed, a chain hoist being needed to lift it.



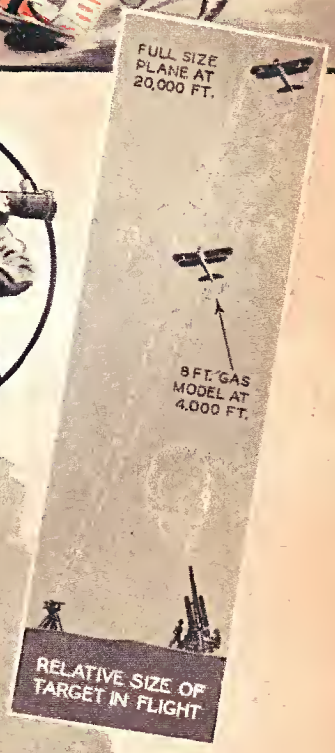
The world's largest propeller dwarfs another of average size.

Exhibit New X-ray Machines

This young lady is receiving shoulder treatment from a powerful 400,000-volt X-ray therapy machine which was exhibited at the Chicago National Convention of Radiologists.

THE latest types of X-ray machines were placed on exhibition at the National Convention of Roentologists and Radiologists held in Chicago recently. Due to its massive size, a 400,000-volt X-ray therapy machine received the most attention from visitors.

Army May Adopt Model Planes As Anti-Aircraft Targets

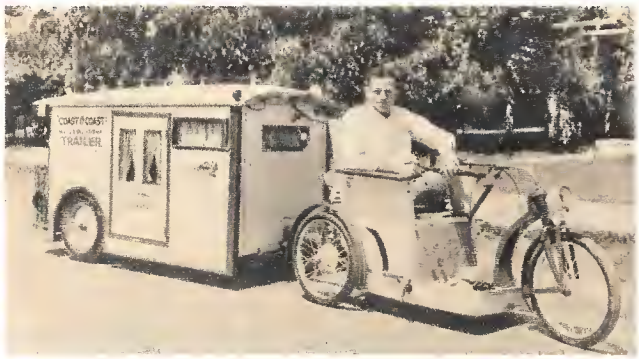


THE possibility of using highly efficient model airplanes as anti-aircraft targets is said to be under serious consideration by U. S. Army tacticians. Powered by compact one-fifth horsepower gasoline engines, the model airplanes easily attain an altitude of 4,000 feet, at which height they would present the same relative target as a real bomber at 20,000 feet.

The model planes to be used, if the plan is adopted by the Army, would be replicas of standard military aircraft and the possibility of controlling the models by radio is being considered. Photo shows a typical model plane gasoline engine.

January, 1938

Legless Youth Crossing U. S. In Motorized Trailer



Operating the engine by remote control from his special seat, Freddie Carson, a legless newsboy, is traveling from California to Florida in this motorized trailer at a speed of 30 m.p.h.

A NOVEL motorized trailer is being used by Freddie Carson, a legless newsboy of Santa Ana, Calif., to make a transcontinental trip to Florida. Although it is only seven feet long and four feet wide, the trailer boasts an electric radio, running water, a bed, and other conventional equipment found on large trailers.

Equipped with a one-horsepower engine, operated by remote control from the youthful driver's special chair, the trailer is said to attain a speed of 30 m.p.h. and run 120 miles on a gallon of gasoline. Carson expects to sell stories of his trip en route.

Model Exhibit Thrills Scouts

GIBRALTER Sea Scouts on a visit to London, England, paid a visit to the Ken View Model Railway Club located at Finchley, and were much intrigued by the club's model train and steamship exhibit. The club members, who make the models under the direction of Colonel G. Beach, an English army officer, range in age from 12 to 18 years.

The model exhibit, which is said to be one of the finest in England, consists of four lines of railroad tracks running along the edge of a miniature river confined between banks of concrete, sand and gravel. The model railroad features the latest types of streamlined engines and cars, while the "river" boasts replicas of well known Thames River boats.

This model train and boat exhibit, said to be one of the finest in England, proved to be a great attraction to a group of visiting Gibralter Sea Scouts. The "river" is about 25 feet long.

Fancy Diver Uses Net "Pool"

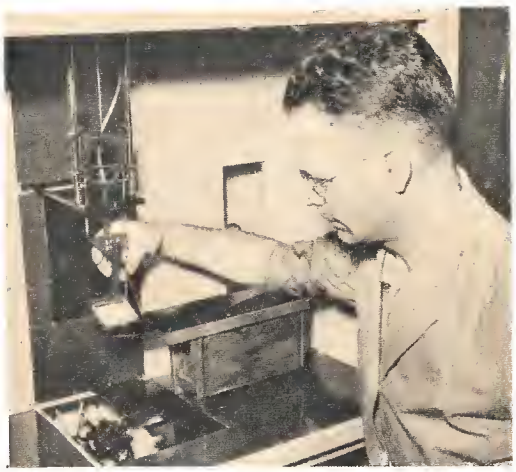
Lack of a practice swimming pool does not deter Roy Fransen, English fancy diver, from keeping in training. A springboard and special net enable him to practice stunts in his garden.

SET up in the garden of his home at Kenton, England, a springboard and specially constructed net enable Roy Fransen, well known fancy diver, to keep in training for contests. The net features a square center of soft matting to prevent Fransen's arms or head becoming entangled in the webbing.

Scale Model Demonstrates New Type Fluoroscope

A ONE-SIXTH scale model of a new type biplane fluoroscope designed to eliminate bulky X-ray equipment was demonstrated at the International Congress of Radiologists in Chicago recently. The apparatus was designed and built by Dr. Edward Chamberlain and O. C. Hollstein, of Temple University Hospital, Philadelphia, Pa.

A full-size fluoroscope, built to the new design, will be entirely shock-proof and will feature X-ray tubes set at a greater distance from the screen to provide a sharper image. With the new device, it will not only be possible to quickly find the position of a foreign body in the lungs, but to also show how deeply it is lodged. Six years were spent in developing the new biplane fluoroscope.



O. C. Hollstein, research engineer, adjusts the screen of a model fluoroscope exhibited at a radiologists' convention in Chicago. The model's floor is cut away to show x-ray tube.

Machine Sells Train Tickets

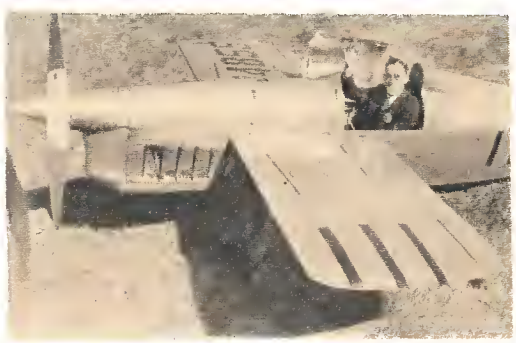
Installed in a Swedish railway terminal, this machine not only issues train tickets and change upon insertion of coins in slots, but also snaps a photo of persons passing slugs.

A NEW device installed at the Stockholm (Sweden) Central Station issues train tickets upon insertion of coins within designated slots, providing exact change if too much money is inserted. An unusual feature of the machine is a built-in camera which automatically snaps a photo of any person who places a false coin in the slots, helping police to make a later arrest.

Home-Built Plane Sets Mark

PILOTING a home-built plane of his own design, S. J. Wittman, of Oshkosh, Wis., set a new record for light racing planes by speeding at 238.225 m.p.h. over a measured course. The tiny plane is powered by an inverted Curtiss D-12 engine of 420 horsepower.

Wittman has made quite some money by entering his home-built plane in races held throughout the U. S. At the National Air Races in Cleveland, Ohio, he won $2,500 by placing second in the Greve Trophy Race and another $1,000 by placing fifth in the Thompson Trophy Race. In the Thompson event, Wittman was leading the field for ten laps, but was forced to slow up when his engine developed motor trouble. The speedy home-built plane is a stubby mid-wing type with a single-seat cockpit.



S. J. Wittman waves a greeting from the cockpit of his home-built racing plane with which he set a new light plane record.

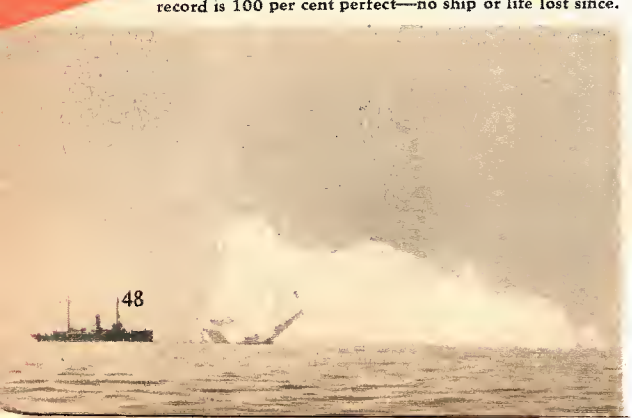
Top—A Coast Guard vessel with a disabled ship in tow. Sometimes it is necessary for these cutters to tow a disabled craft hundreds of miles to a friendly port. Left—The white hull of a Coast Guard cutter is a pleasant sight to many a disabled boat.

Neither wind nor sea prevents the Coast Guard from proceeding to the rescue when an SOS is received.

GUARDIANS

by Clifford Peters

One of the most important duties of the Coast Guard is to keep ships warned of the location of icebergs. When the Titanic went down after striking one of these bergs, the Coast Guard went to work to prevent a recurrence of that tragedy. Their record is 100 per cent perfect—no ship or life lost since.



"ALWAYS Ready" is the motto of the United States Coast Guard. During every minute of the day, every day of the year, thousands of men and millions of dollars worth of equipment are ready to answer calls of distress from any ship at sea. No call goes unanswered. Ships or planes are under way within a few minutes after a call for help is heard or seen.

During each of the past sixteen years, nearly 4,000 lives have been saved by the Coast Guard, and more than 8,000 calls for assistance have been answered. The value of vessels assisted each year exceeds $40,000,000.

The Coast Guard was started as a law en-

OF THE SEA

forcement agency, but today its principal duty is the saving of life and property at sea and on the coast. For every dollar spent for Coast Guard operations, two dollars are returned in the form of property saved. This does not include the inestimable value of lives saved.

Organized August 4, 1790, the Coast Guard was first called the "Revenue Marine Service." It was started at the request of Alexander Hamilton, then Secretary of the Treasury, for the specific purpose of eliminating smuggling. Before the Revolutionary War, smuggling had been practiced as a means of side stepping the payments of unpopular duties imposed by a more unpopular King George.

Even after the war, these same smugglers and many new ones found it profitable to continue their activities under the new government. After a short time, Mr. Hamilton found that the treasury was greatly in need of money and that one of its principal revenues, duty on imported merchandise, was not as great as he thought it should be.

Because appeals to the consciences of the smugglers were found to be useless, he went to Congress and requested funds with which to build ships. And that these ships would have more than a moral effect on the smugglers, he planned to mount guns on them, as many as fourteen, on each cutter.

In November of 1791, Hamilton's first cutters went into service. Within a short time, his opinions proved to be correct. Smuggling began to disappear and much-needed cash flowed into the treasury.

Those first few cutters, which cost about $1,000 each and were 36 to 40 feet long, have grown into thirty-seven large cruising cutters, most of which measure more than 200 feet long, and more than 150 smaller craft.

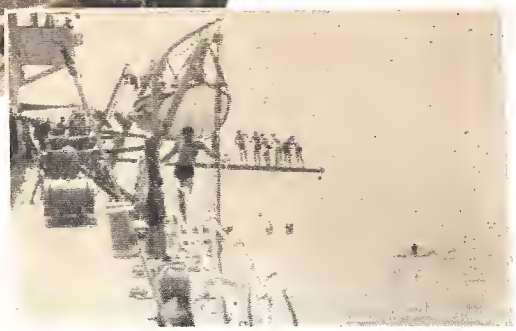
Though not generally known, the Coast Guard antedates the United States Navy by several years. The first Navy ships were launched in 1797,, under Secretary of the Navy Benjamin Stoddert. In time of war, the Coast Guard automatically becomes part of the Navy. The United States suffered its largest naval loss of the World War with the sinking of a Coast Guard vessel off the coast of Ireland. The ship and all hands were lost.

One of the principal services of the Coast

The Coast Guard Cutter Champlain. This vessel has participated in many thrilling marine rescues. Each Spring when the ice season starts, the Champlain goes off on ice patrol. Before the season is over, late in June, usually several ships have been towed into port and countless persons have been assisted in gaining shore.

The radio room on one of the Coast Guard cruising cutters. Here a continuous watch is maintained on the International distress frequency and the Coast Guard calling frequency. Several transmitters and receivers are ready for use twenty-four hours a day.

If a hole is stove into the hull because of a collision with another ship, immediate covering of thet hole might mean the difference between life and death for meny persons. The photograph shows a "collision mat" being prepared for use. With a rope at each corner it is lowered over the side end adjusted so thet it covers as much of the hole as possible. While this mat may not keep a ship afloat indefinitely, it could slow up a lerge inrush of water long enough to permit more permanent repairs to be made. Below — When the "Champlein" is in werm waters, swimming is part of the day's routine. Because Coast Guardsmen may be forced overboerd during rescue operations, each man must be eble to take care of himself in, as well as on, water.



Guard to the world at large is the maintenance of the International Ice Patrol, which was instituted soon after the *Titanic* was lost.

Each spring when the ice starts to move southward from the Arctic regions, the Ice Patrol goes into operation. When the southernmost berg is sighted by a patrol ship, its position is broadcast. During daylight hours, the Coast Guard vessel continually searches for bergs, and each night it returns to the southernmost one and drifts with it until morning. This is repeated daily until the end of the ice season, when the bergs have been reduced in size by the warm water until they no longer are dangerous.

Contrary to the belief of many persons, there is no way to destroy these monsters of nature. Although attempts have been made to destroy them by shell fire and by dynamiting, both methods have been unsuccessful. The most effective weapon has been found to be a knowledge of their exact location.

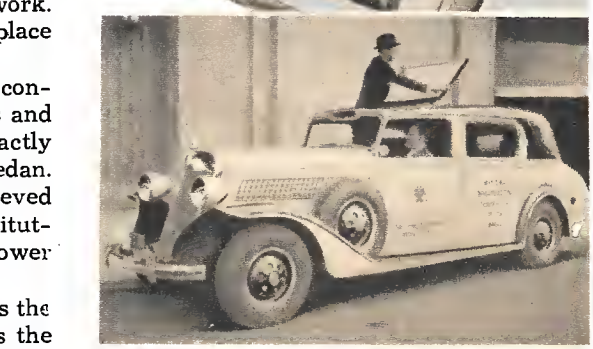
[*Continued on page* 149]

It's not all play eboard e Coest Guard cutter. Here the crew is washing down the deck, a not unpleasant task on werm deys, but not so pleasant when the thermometer has started its trek downward. Right—Because the Coest Guard may be celled upon to eid in protecting our shores, gunnery prectice is part of the daily routine.

AUTO RADIO "DE LUXE"

Below—The control panel is directly behind the front seat of the new NBC mobile transmitter car. The ultra-high frequency receiver and the speech amplifying equipment are contained in this cabinet. In the space usually occupied by the rear seat is the 50-watt intermediate frequency transmitter and the 40-watt ultra-high frequency transmitter.

Center — A gasoline-driven generator supplies power for the transmitters. The use of a generator effected a considerable weight reduction by eliminating storage batteries. Bottom—A trap door in roof of car affords the announcer an unobstructed view in all directions.



TO MEET the growing need for broadcasting from outside points, the National Broadcasting Company, of Chicago, Ill., has outfitted a new car with all necessary equipment for this type of work. The vehicle is capable of traveling from place to place at high speeds.

The equipment for this mobile unit consists of two transmitters, three receivers and a gasoline driven generator, all compactly mounted in a specially built touring sedan. Considerable weight reduction was achieved by discarding storage batteries and substituting the generator for the transmitters' power supply.

Immediately in back of the front seat is the control panel and console, which houses the ultra-high frequency receiver and the specially designed four-stage high gain audio amplifier. To the rear, in the space usually occupied by the back seat, is a large compartment containing a fifty-watt transmitter, used for stationary broadcasts. A forty-watt ultra-high frequency transmitter is used for mobile broadcasts. The mobile unit is so designed that one man can drive and broadcast at the same time.

Glider Launched From Cradle Atop Speeding Auto

A special track mounted atop a passenger auto enables Don Stevens to launch his glider without use of tow-lines or catapults. Glider leaves auto when sufficient speed is attained. Idea inspired MM cover reproduced at right.

A NEW method of launching a primary glider has been developed by Don Stevens, of Redondo Beach, Calif., in which the glider is carried on a specially constructed track mounted atop a passenger auto. The glider is held to the track until the auto has attained sufficient speed to create lift on the glider's wing, upon which it is released for free flight. The new launching method is said to be as practical in operation as the usual tow-line and catapult methods.

Stevens used a simple primary type glider to conduct his novel launching experiments, but glider pilots believe that secondary or soaring sailplanes would fare even better when launched by the new method due to their superior lift qualities at various speeds. Only a short run of the car would be necessary when launching a highly efficient sailplane.

On the cover of this issue, a MODERN MECHANIX artist has depicted the launching of an imaginary sailplane of highly streamlined design by the Stevens method. The hook-like objects protruding from the sides and nose of the sailplane are the means by which the glider would be held to the launching cradle atop the speeding auto until the pilot decided to release it. Once free of the launching cradle, the pilot would retract the hooks by a gear mechanism, cutting down wind resistance to an absolute minimum.

The editors would like to hear from glider enthusiasts who have tried other novel launching methods.

Converted Bus Serves As Mobile Lunchroom–Home

By converting this former passenger bus, the new owner established both a business and residence. Lower section serves as a lunch counter while upper is fitted as living quarters.

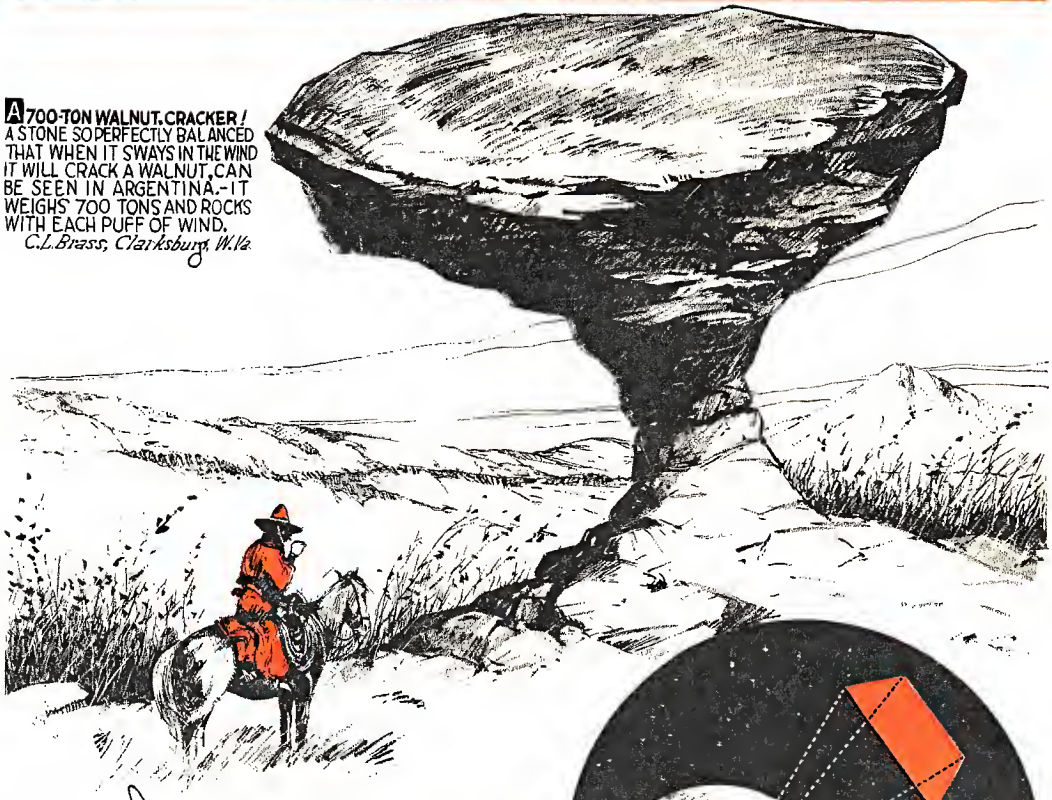
A FORMER Fifth Avenue (N. Y. City) bus has been converted into a perambulating lunch room and residence by its enterprising owner. Parked along the shore of Lake Copake in eastern New York, the lower section of the bus serves as a lunch room and counter for swimmers and fishermen, while the upper section is fitted out as living quarters for the proprietor.

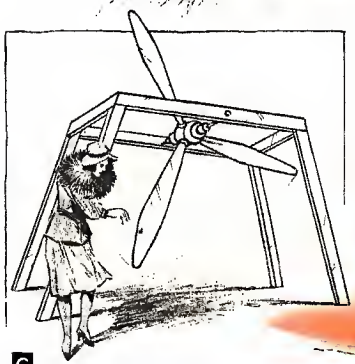
Addresses of manufacturers of products mentioned in MODERN MECHANIX can be obtained by sending a stamped, self-addressed envelope to the editors.

A 700-Ton Swaying Nut Cracker

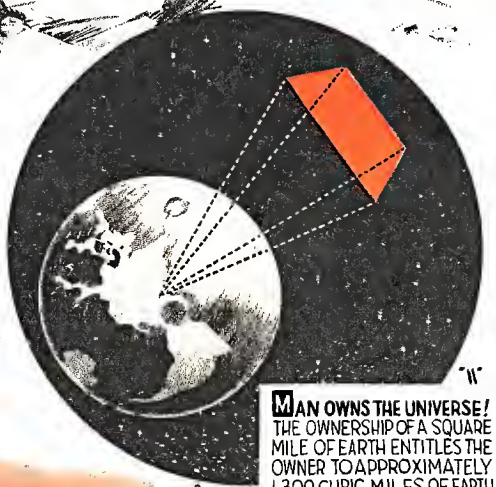
NIC SPRANK OFFERS $5.00 FOR BEST ODDITY

A 700-TON WALNUT-CRACKER! A STONE SO PERFECTLY BALANCED THAT WHEN IT SWAYS IN THE WIND IT WILL CRACK A WALNUT, CAN BE SEEN IN ARGENTINA.—IT WEIGHS 700 TONS AND ROCKS WITH EACH PUFF OF WIND.
C. L. Brass, Clarksburg, W. Va.



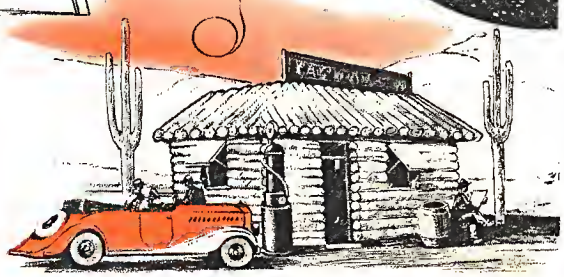


GAS STATION OLDER THAN GASOLINE!—IN LAMAR, COLORADO, A GAS STATION HAS BEEN ERECTED FROM PETRIFIED WOOD, APPROXIMATELY 175 MILLION YEARS OLD. THIS "TIMBER" IS AS FIRE-PROOF AS STONE AND THE ROOF ALONE WEIGHS 90,000 POUNDS.—
J. F. Dopak, Jr.
Chicago, Ill.



MAN OWNS THE UNIVERSE! THE OWNERSHIP OF A SQUARE MILE OF EARTH ENTITLES THE OWNER TO APPROXIMATELY 1,300 CUBIC MILES OF EARTH 300 CUBIC MILES OF AIR, AND COUNTLESS MILLIONS OF STARS, COMETS, METEORS, AND AT TIMES EVEN THE SUN AND THE MOON—AND ALL BECAUSE OF A LAW WHICH STATES THAT "THE OWNERSHIP OF A TRACT OF LAND EXTENDS FROM THE CENTER OF THE EARTH TO THE ZENITH."
—E. J. Richlik, Cicero, Ill.

CHEWING GUM TURNS PROPELLER!—BECAUSE THE PROPELLERS OF THE GIANT AIRLINERS ARE BALANCED SO PERFECTLY, A PIECE OF CHEWING GUM PLACED ON THE TIP OF ONE OF THE BLADES, BECAUSE OF ITS WEIGHT, WILL CAUSE IT TO TURN.—
W. Prichard, Kansas City, Kan.



Five dollars will be paid for the oddity selected by Nic Sprank as the best of the month. One dollar will be paid for all others used on this page. Send your oddity to Nic Sprank, Modern Mechanix Publishing Company, 1501 Broadway, New York, N. Y. Source or proof of each oddity must be given. Send all oddities separately, not with other manuscripts or letters.

Electrostatic Device Clears Air Of Smoke, Pollen

This electrostatic air cleaning machine removes dust, smoke and pollen from the air by ionizing particles and causing them to pass over grounded plates to which they cling. Young lady is shown testing the device with tobacco smoke.

DESIGNED for home or factory use, a compact electrostatic air cleaner device was recently placed on exhibition at a convention of iron and steel engineers held in Chicago, Ill. The new cleaner is said to remove dust, smoke, and pollen from the air more efficiently than ever before.

In operation the electrostatic cleaner forces the air through an ionizing screen and the solid particles in it, 90% of which would pass through the average filter, are electrically charged. The air is then passed over grounded plates, causing the dust and pollen particles to cling to them.

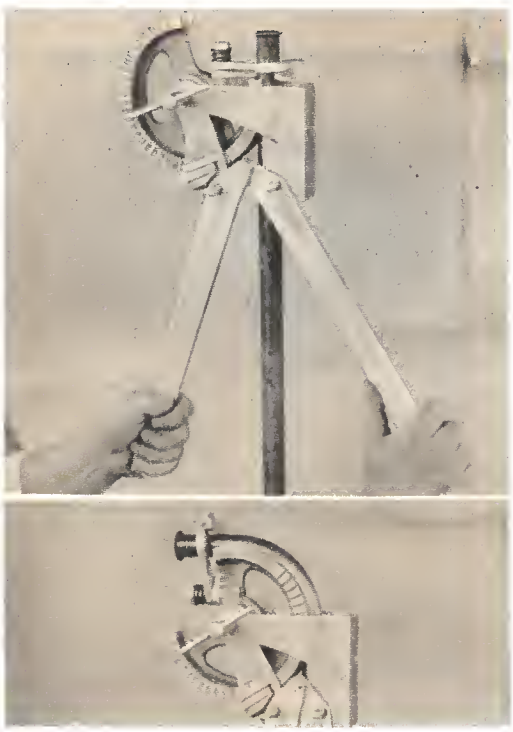
Microphone Aimed Like Gun

A "MACHINE GUN" type of microphone that picks up a maximum of sound from the object or spot upon which it is focussed has been developed by a leading electrical equipment manufacturer. The device derives its name from the fact that it is mounted on a swivel joint atop a tripod and is aimed much in the manner of a machine gun.

The novel microphone received an exacting field test when it was placed on a balcony of the Empire State building in New York during the American Legion Convention.

Aimed like a machine gun, this microphone was used to pick up band music during American Legion parade in New York.

Machine Bends Pipe 180°



Bending pipe to any angle up to 180 degrees is easily accomplished with device shown at top. Lower—Pipe bent to shape.

REQUIRING very little physical effort, a new lever-operated machine quickly bends pipe, at any point along its length, to any desired angle up to 180 degrees. The bender is made in sizes accommodating pipe diameters of ⅜, ½, ¾ and one inch. Each movement of the machine's ratchet mechanism bends the pipe a fixed number of degrees, a long handle providing leverage.

Doll House Features Complete Interior Furnishings

If it were not for the builder's hand (right), one would believe the room to be that of a modern dwelling instead of an interior view of the beautiful doll house shown at left. The house walls can be removed to permit placing of furniture.

STANDING 31 inches high with a floor plan of 26 x 30 inches, a novel doll house constructed by a stenographer and her father as a hobby features all the furnishings and details found in the average real home. Lighting is supplied by small floor lamps connected to a transformer concealed in the tiny home's attic, the wiring being concealed by running it down a chimney and under the flooring of the furnished rooms.

The first floor of the doll house boasts a long living room with a fireplace, a reception hall with an open stairway at the end of the living room, a dining room and a kitchen. On the second floor are a master bedroom, a nursery, a bathroom and a hall with a rail that constitutes a balcony overlooking the miniature hall below.

The furnishings of the miniature dwelling are true to the best standards of interior decoration and are built to a perfect scale of the prototypes. Included in the furnishings are a grand piano, the top of which raises; a davenport, which can be divided into separate chairs; a refrigerator; a set of silverware; hand-made hooked rugs; monogramed kitchen towels, etc.

The "family" occupying the doll house consists of a pin cushion doll serving as a mother; a father with his pipe in one hand; a little girl with her pet cat, and a baby in a tiny crib.

Most of the parts for the doll house were turned on a lathe. The door knobs were cast in bronze and the windows and door panes were leaded in. The doors actually swing on hinges, but in order that one may see the insides of the house, the sides are removable in four complete sections.

Boys Build Passenger Train

USING salvaged mining equipment, Walter Osborn and Hugh Fife, of Bakersfield, Calif., constructed a miniature streamlined train 40 feet long, 5 feet high and 3 feet wide. Powered by a gasoline engine, the "Silver Streak," as the train is named, is capable of a 25 m.p.h. speed.

The novel train is equipped with air brakes, an air horn, a generator for electric lights and seats for 20 passengers. In spite of the saving through use of the salvaged mining parts, wheels, iron frames, etc., the home-built train and its 1,000-foot track cost $1,000.

Walter Osborn and Hugh Fife devoted three years of spare time to building this 20-passenger streamlined "Silver Streak" train. Powered by a gasoline motor, the train travels 25 m.p.h.

Prophetically depicting what future commercial rocket flight "space ships" will look like, a recent motion picture features scenes showing a passenger rocket taking off from a long runway (left) and another super-rocket ship being nosed out of its hangar (left center) in preparation for a transcontinental flight at speeds surpassing 1,000 miles per hour. Bona fide rocket experimenters, however, acknowledge that it will be a long time before passenger rockets will be practical.

Rocket Flight—Dream Or Reality?

In the photo at right, an experimental rocket is seen just at the moment of leaving the ground. Rockets do not have to be shot into the air in order to conduct tests, but are usually "launched" on a proving stand, special instruments indicating power, rate of climb, and other data.

Much in the manner of pioneer aircraft experimenters, groups of rocket fans are constantly seeking to improve rocket flight in an effort to hasten the day when commercial rocket travel will be practical. Left—German experimenters with a newly developed rocket. Above—Test plane fitted with a rocket motor at tail. Rocket motors have also been tested in boats and automobiles.

Brushes In Sorting Machine "Shave" Fuzz From Peaches

CUSTOMERS complaining about the fuzz on peaches he sold them caused William W. Heritage, of Richwood, N. J., to seek some means of removing the offending substance. The enterprising peach grower solved his problem by attaching a series of brushes to his sorting machine in such a manner that they strip or "shave" the fuzz from each peach as it is brought in contact with them. The residue is deposited in baskets at one side of the machine.

The peaches are shaved so finely that very little of the flesh is lost in the process. Housewives are said to favor the shaved peaches because the drudgery of peeling the fruit for desserts is eliminated.

Peaches fed to a conveyor belt of this sorting machine (top) pass through a series of brushes that "shave" the fuzz off, after which peaches are selected for size and grade (bottom).

Surfboard Has Folding Fin

Incoming waves strike the fin of this new type surfboard and propel it to shore at a fast speed. An air-tight compartment prevents surfboard from nose-diving, while a rudder guides it.

A NON-SINKABLE surfboard invented by William L. Wheeler, of Los Angeles, Calif., is fitted with an air-tight compartment at the nose, a folding fin, and a fixed rudder. The air-tight compartment prevents nose-diving in the surf when incoming waves strike the folding fin and help propel the board shoreward. The rudder serves to guide the novel surfboard in a straight path.

Builds Midget Powered Bus

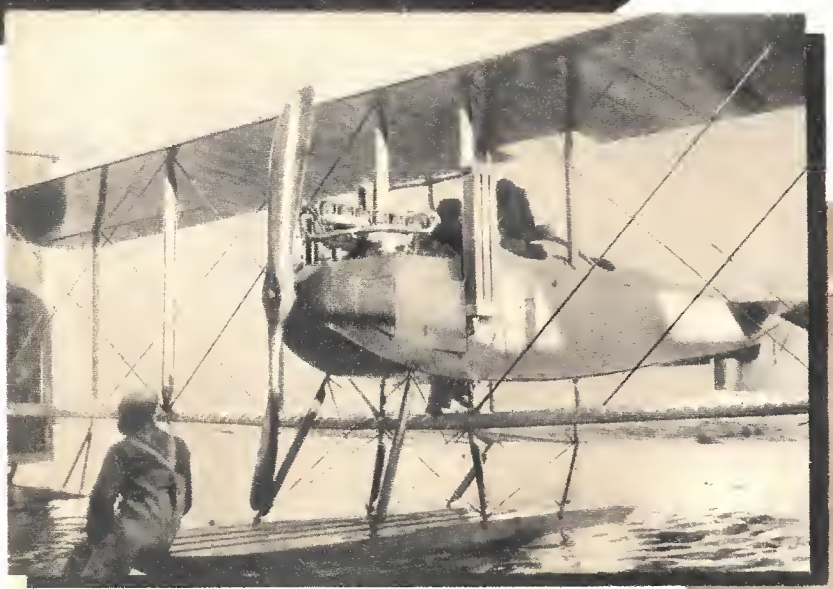
USING old tins, scrap wood, saucepan lids and other junk, Ernie Johnstone, a bus driver in Brighton, England, spends his spare time building miniature buses. His latest model is powered by a motorcycle engine, is fully insured and licensed for operation on the highways. The tiny buses have made Johnstone very popular with local children.

Ernia Johnstone, a Brighton, England, bus driver, takes two juvenile friends for a ride in the midget bus he constructed from junk. The vehicle is licensed for highway operation.

Martin —

by Robert H. Rankin

A self-taught designer-pilot whose planes have made history.



Glenn L. Martin, shown examining a model of his famous "China Clipper," was one of the first American pilots awarded an international license issued by the Federation Aeronautique Internationale, and is credited with being the third man in the world to build and successfully fly an airplane of his own design. An early Martin single-float seaplane is shown above. Contrast its size and consrruction with the world-famous, 130-foot span Martin "China Clipper" shown at right.

"Early Bird" of Aviation

THE name of Glenn L. Martin is one of the oldest, as well as one of the best known in the entire field of aviation, having been associated with aeronautics since the days of the "Early Bird" pioneers who followed fast in the footsteps of the Wright brothers. His bombing planes, with their high speed and wide cruising range, revolutionized theories of aerial bombardment, and his big "Clipper" flying boats have demonstrated the practicability of air transportation over the Pacific.

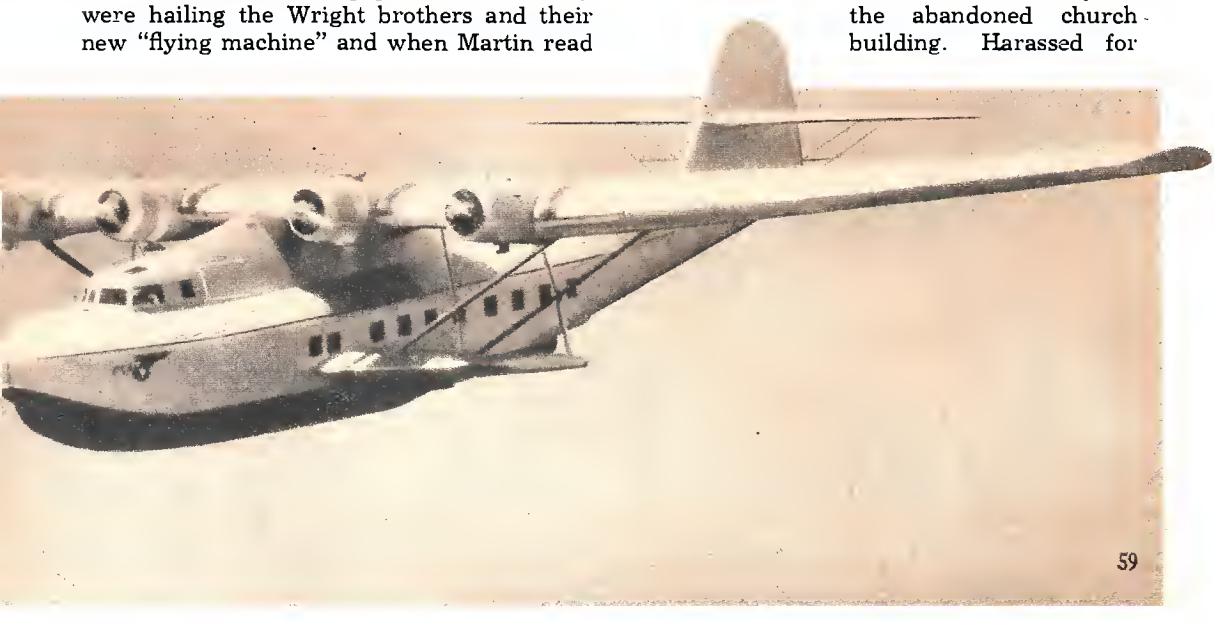
As a lad in Salina, Kansas, he evidenced a marked interest in mechanics and won a reputation for being able to repair anything from a bicycle to a threshing machine. A great reader, he eagerly followed the accounts of the glider experiments of Chanute and Lithenthal. Experimenting first with large kites, then with gliders, Martin dreamed of the day when he would fly a powered craft.

In the meantime, he completed his public school education and went to Kansas Wesleyan College, where he studied for two years. His parents then moved from Salina to Santa Ana, California, and Glenn joined them, obtaining employment as a garage mechanic in his new home town.

At this time the newspapers of the country were hailing the Wright brothers and their new "flying machine" and when Martin read of their success he decided that he would build a machine of his own. He hired an abandoned church to build it in and worked on the craft daily. Mrs. Martin had the greatest faith in her son and when it became too dark for him to see she would hold a lighted kerosene lamp for him so that he might continue his building far into the night.

After much hard work and an abundance of discouragement and criticism from fellow citizens, Martin finally completed his plane in 1909. Wheeling it out into the California sunshine, he was determined that he would make it fly or die in the attempt. He took his place at the controls and the propeller was spun by an obliging, if somewhat skeptical spectator. The coughing, spluttering 14 h.p. second-hand engine came to life and as the propeller bit into the air, the craft moved forward. Gaining speed rapidly, it lifted into the air and Martin became the third man in the world to build and successfully fly a heavier-than-air craft of his own invention and construction.

At once, he decided to enter the airplane manufacturing business and gathering seven ex-automobile mechanics about him, he established his factory in the abandoned church building. Harassed for



a time by poverty and forced to borrow and almost beg materials, Martin kept his plant running. During the warm summer months he took his old pusher biplane and barnstormed about the country to raise funds to carry on his work. Allowing nothing to discourage him, he kept his factory running full blast and by 1913 was recognized as one of the largest airplane builders in the world.

In the meantime he had advanced in flying skill and was awarded a medal for making a then amazing twenty-eight mile over water flight from the California mainland to Catalina Island. He became one of the first Americans to be given the international license of the Federation Aeronautique Internationale. In order to win this license or certificate it was necessary to make six complete circlings of the airdrome at an altitude of 163 feet and 5 inches (just why this particular altitude was specified is not known). In addition to this, it was required that a series of figure 8's be completed at the same altitude around pylons which were spaced 500 feet apart. To wind up the qualifications, it was required that the candidate make a landing within 163 feet, 5 inches of a given mark. These requirements seem very easy today, but it required considerable skill to do them with the flying box kite planes of 1911.

In addition to the Certificate of the F. A. I., Martin was awarded Expert Aviators Certificate No. 2 of the Aero Club of America.

Incorporating his factory as the Glenn L. Martin Company, the young pilot-builder at first concentrated on producing planes for barnstormers and intrepid sportsmen. Moving his plant to Los Angeles, he built the first American training plane. In 1913 this trainer, which was known as the TT tractor, was adopted by the War Department as a standard training ship for the Army. In hydroplane form, the TT won the

[*Continued on page* 118]

Carrying a total load of 1,500 pounds at 118 m.p.h., the Martin MB-1 (circle) was considered the last word in bombing planes in 1918-22, but it can't compare with the modern Martin B-10 (below) which carries 4,000 pounds of bombs at speeds surpassing 200 m.p.h.

Thousands of aviation enthusiasts throughout the U. S. are receiving flying instruction in airplanes of the "flivverplane" class—planes equipped with motors of 40 horsepower or less. Right—Typical flying club group with a Taylor Cub airplane. Powered with a four-cylinder 40 h.p. engine, the Cub is one of the most popular airplanes in America. Selling for less than $1,300, more than 1,375 Cubs have been sold in the last six years.

"FLIVVERPLANES" POPULARIZE FLYING

Possessing trim lines, the Rose "Parrakeet" biplane (circle) is a single-seater and especially adapted for flying by students who have soloed and desire to accumulate additional flying time needed to obtain a pilot license of higher grade.

Increasing in popularity daily, the Taylorcraft (above) is one of the latest arrivals in the light plane field. The cabin features side-by-side seating and wheel-type controls in place of the conventional stick type. Prices of leading "flivver-planes" range from $1,200 to $1,800, with all models available on installment purchase plans featuring very liberal terms.

Powered by a 40 horsepower motor, the Welch sport monoplane shown above boasts a top speed of 96 m.p.h., yet lands at the low speed of 29 m.p.h. Operating cost is claimed to be about one cent per mile. Right—The Aeronca "K", latest of a long line of Aeronca planes that hold 19 out of 33 official world's records issued for planes of all categories. The model "K" cabin features side by side seating and space for several small suitcases as well, making it extremely popular with many sportsmen pilots.

Mariner Plans World Voyage In Small Catamaran

Captain William Salston (left) is assisted by Poultney Bigelow, a friend, as he constructs the canoe catamaran in which he plans to make his 31st round-the-world sailing trip.

A HOME-BUILT catamaran composed of three specially designed canoes will be the unusual means by which William Salston, a retired sea captain, hopes to make his thirty-first sailing trip around the world. The canoes are being built at Malden-On-The-Hudson, N. Y.

The center canoe of the catamaran will be 25 feet long and 41 inches wide, according to Captain Salston, and the two canoes on either side, serving as outriggers, will measure 16 feet in length and 36 inches in width. The sail for the craft will measure 350 square feet and a speed of 20 knots is expected of the craft when favored with a stiff breeze during the voyage. The canoes will be covered, providing dry storage space for food supplies and emergency sailing gear.

New "Pup" Tent Developed

A NEWLY developed "pup" tent is equipped with collapsible dural metal poles and can be folded into a compact roll that can easily be carried on the back. The tent weighs only six pounds but, despite its lightness, features conveniences such as a mosquito screen, zipper front, vents for air circulation and an attachment for suspending a small light inside.

Although small in size, the new tent is high enough at the peak to permit a man to dress inside and is tapered toward the back to give a streamline effect valuable in windy weather. The entire tent is made of a durable, rain-proof fabric and the floor is of the sewed-in type, serving to keep out crawling bugs, snakes and insects.

MAN-SIZED "PUP" TENT

Featuring collapsible poles, this "pup" tent can be rolled into a compact bundle for easy carrying. Floor is sewed-in.

Rink Uses 9 Miles Of Pipe

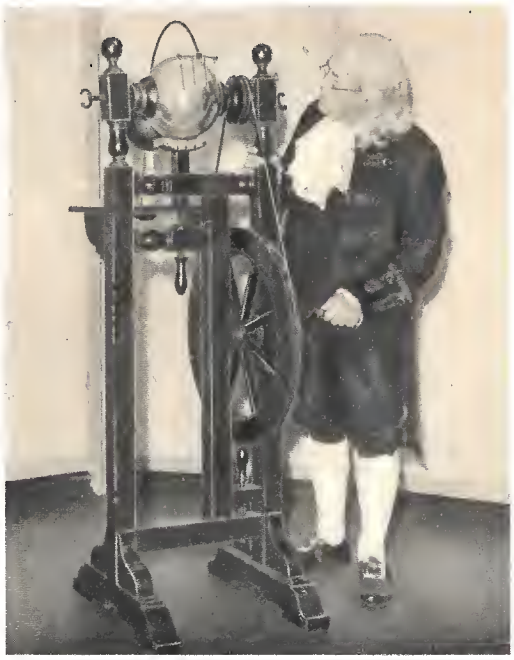
These workmen are placing packing over the nine miles of ammonia-filled piping used in making an English ice skating rink.

MORE than nine miles of ammonia-filled piping was required to convert a swimming pool in Wembley, England, into an indoor ice skating rink. The piping was placed on a wooden flooring supported by a steel scaffolding and covered with packing material to provide an even surface. Water was then allowed to flow over the piping until a depth of several inches was attained, after which freezing occurred.

Early Franklin Generator Lights Modern Highway

DURING recent ceremonies attending the renaming of one of Philadelphia's parkways as "The Benjamin Franklin Parkway," an electric generating machine constructed by the famous statesman was used, in conjunction with modern electrical equipment, to illuminate lights along the thoroughfare.

Turning a crank of Franklin's machine, Mayor S. Davis Wilson caused an early Edison generator to produce an electric current which gradually illuminated an early incandescent lamp. When the lamp produced a certain amount of light, it energized a photo-electric cell which operated a relay, sending a 60-cycle current over wires to light the numerous parkway lamps.



Impersonating Benjamin Franklin, William T. Innes, of Philadelphia, Pe., turns the crenk of an electric generating machine built by the femous statesman. The machine was used during ceremonies at the naming of city's Benjamin Franklin Parkway.

New Zep Nears Completion

Presenting the appearance of a huge spider web, the LZ-130 new German Zeppelin, nears completion at Friedrichshafen.

UNDAUNTED by the *Hindenburg* disaster, German engineers have nearly completed a sister ship of the ill-fated Zeppelin, the LZ-130, at Friedrichshafen, birthplace of all German airships. The entire framework of the new air monster has been completed and about three-quarters of the outer covering has been affixed. Non-inflammable helium gas will be used.

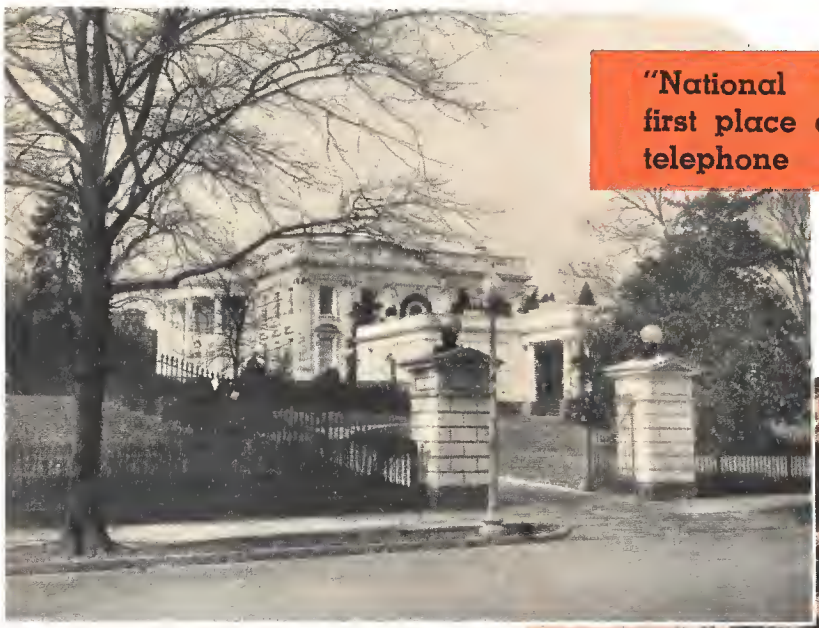
Scouts Create Tree "Books"

A NOVEL tree bark and wood sample "book" collection has been created by a group of Boy Scouts in Winston-Salem, N. C. Each of the "books" is made up of wood slabs and branches, serving as binders, secured from ninety different tree samples.

Neatly lettered labels, supplying the names of the trees from which the books are made, are glued in the position ordinarily occupied by a book title. Development of the novel books combined four hobbies—hiking, woodcraft, botany and woodworking.

Ninety different tree samples were used to make this novel "book" collection. Bark serves as bindings for the books.

The WHITE HOUSE



"National 1414" holds first place among U. S. telephone subscribers.

The White House must be capable of immediate contact with principal capitals of the world. A gigantic network of phones meets this important communication requirement.

When the President wants to talk to a ship at sea, this operator connects the call to the desired vessel. The equipment is located at the Deal Beach, N. J., station of the Bell Telephone Laboratories.

by James Nevin Miller

WHAT might properly be called the "number one" telephone in the nation is listed in the Washington phone book as National 1414. This is the official home of Franklin D. Roosevelt. Better served is he by telephone than any other person in the world. Better by far than any President we've ever had.

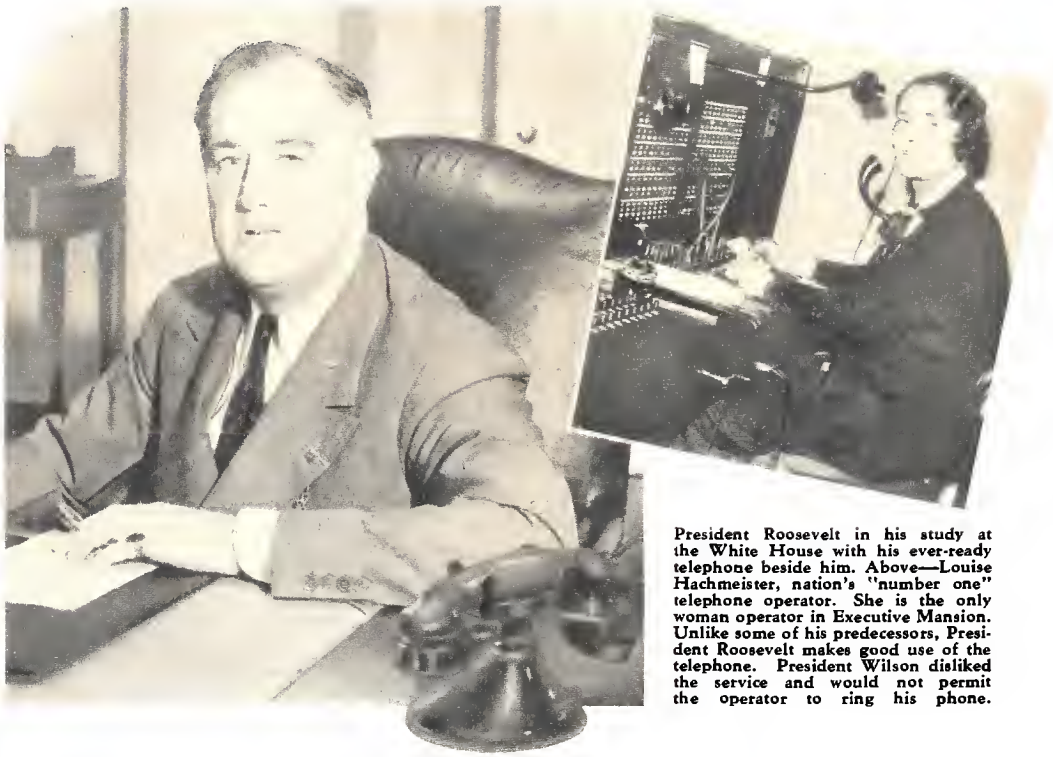
At any moment, day or night, Mr. Roosevelt can select any one of 150 phones and talk with friends, official emissaries of our government, in fact, anybody in almost any nation in the world. Sixty different countries are now linked by telephone service. These countries have an aggregate of over thirty million telephones, according to official estimates, of which some eighteen million are on the North American continent and over ten million in Europe.

These figures seem rather bewildering when you realize that the White House staff and its equipment are exceedingly small. There are only five operators, all of them men except one, and a single switchboard. But it's a dandy—a three section PBX or private branch exchange. Usually three operators are on the job at one time. They work in shifts.

The switchboard is located in the new executive offices on West Executive Avenue on the second or top floor. Mr. Roosevelt's private office is close by—on the first floor.

Through this board the Chief Executive and his office force have direct communication with all major government departments and the Capitol. There are also a good many private lines leading to the homes of close personal friends and administration advisers. The official residence has telephones in the study and most other rooms, including the

Talks to the WORLD



President Roosevelt in his study at the White House with his ever-ready telephone beside him. Above—Louise Hachmeister, nation's "number one" telephone operator. She is the only woman operator in Executive Mansion. Unlike some of his predecessors, President Roosevelt makes good use of the telephone. President Wilson disliked the service and would not permit the operator to ring his phone.

head usher's office at the private entrance.

At first thought you naturally wonder why so many phones are utilized in the White House. But the reason is obvious enough. In his work the President probably has more responsibilities than any other business executive in the world. The entire functioning of our government, except of Congress, is under his control. So he must be immediately available every minute of every day in the year.

Operating the White House switchboard is a young woman whose ability to maneuver its cords and keys and use her head at the same time brought her to the personal attention of President Roosevelt and others in high command.

She is Louise Hachmeister, a dark-haired, square-jawed, smiling, super-operator who

Talking over seas today is a very simple matter for the White House. Here is shown the receiving antenna arrays used for trans-ocean communication. It is the short-wave radio telephone receiving center of the American Telephone and Telegraph Company, at Netcong, N. J. It is the portal of speech for some sixty countries.

Right—When Mr. Roosevelt wants to use Japan-America telephone service, he needs the help on this young lady, Miss Chizura Kashiwagi, operator stationed at the International Toll Board, Tokyo.

Above left—At this switchboard, in the long distance headquarters of the American Telephone and Telegraph Company, New York, specially trained operators handle all calls between points in North America and Europe, South America and the Far East.

These men can connect the President's voice with sixty nations. The man in the foreground is seated at the controls of one of the four radio transmitters. At the left is the power panel associated with these transmitters.

served for fourteen years as a New York City "hello girl." Miss Hachmeister was assigned to the switchboard of the Roosevelt headquarters during his campaign, back in '32. So well did she do her work that the late Col. L. M. Howe, Mr. Roosevelt's confidential secretary, took her to the White House.

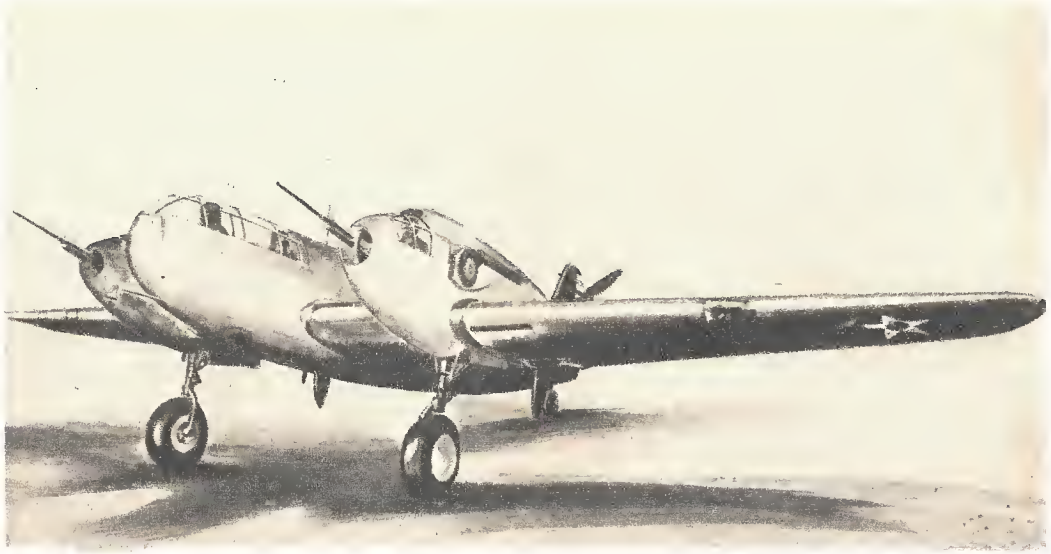
Should the President want to talk with the commander of the United States fleet, stationed temporarily, let us say, in Hawaii, he would simply pick up one of his many phones and say to Miss Hachmeister: "Get me Admiral Arthur J. Hepburn in Honolulu." First of all, America's number one "hello girl" would dial long distance and say: "The President wants Admiral Hepburn in Honolulu." Whereupon the long distance operator would call the Foreign Service switchboard in New York City, which handles all calls outside the United States proper, and route the call to Honolulu, via San Francisco.

Undoubtedly the high-ranking Navy officer could be reached directly or indirectly through the Pearl Harbor Navy yard, so a connection would be established with the yard. In actual practice, if the Admiral were present there, the call would be completed within five to ten minutes! But if he happened to be on shipboard the local operator would call him by wireless telephone with a message something like this: "The President is calling. How soon can he be ashore?" Chances are that in such case the Admiral would reply: "In about fifteen minutes."

Of course, during the interim Mr. Roosevelt wouldn't have to keep his ear glued to the receiver. The phone folks would hold the line open while he attended to his other official duties. Then when the Admiral reached shore Miss Hachmeister would ring the President and the trans-Pacific conversation would begin.

[*Continued on page* 130]

New Army Plane Designed To Fight Huge Bombers



An artist's sketch of the XMF-1, a new type of pursuit plane developed for the U. S. Army Air Corps. Its twin pusher engines of 1,000 horsepower each are expected to drive it along at at over 300 m.p.h. Full armament consists of six machine guns.

CARRYING a crew of five, six machine guns and bombs, a new type of pursuit plane has been developed for use by the U. S. Army Air Corps. The aircraft, believed to be the fastest military plane in the world, is a low-wing, all-metal monoplane powered by twin engines of 1,000 horsepower each. At present, performance and design figures are being withheld by the Air Corps.

The new aircraft was designed primarily for attack tactics against the "flying fortress" type of bombers being used generally by leading nations.

Departing radically from conventional pursuit plane design, the XMF-1, as the plane is officially designated, is a pusher type, the engines and propellers being at the rear of the wings.

Gunners are located in nacelles protruding from the wing section on each side of the fuselage of the new fighter. Complete interchangeability of crew is possible while in flight, a passageway connecting the outboard gunners' compartments with the main fuselage. Thus, the radio-operator or navigator can relieve the gunners if necessary. The placing of the wing gunners ahead of the engines makes it possible for them to exchange visual signals with the pilot during maneuvers. All compartments are heated and equipped with oxygen tanks, enabling the crew to work in comfort at altitudes up to 30,000 feet.

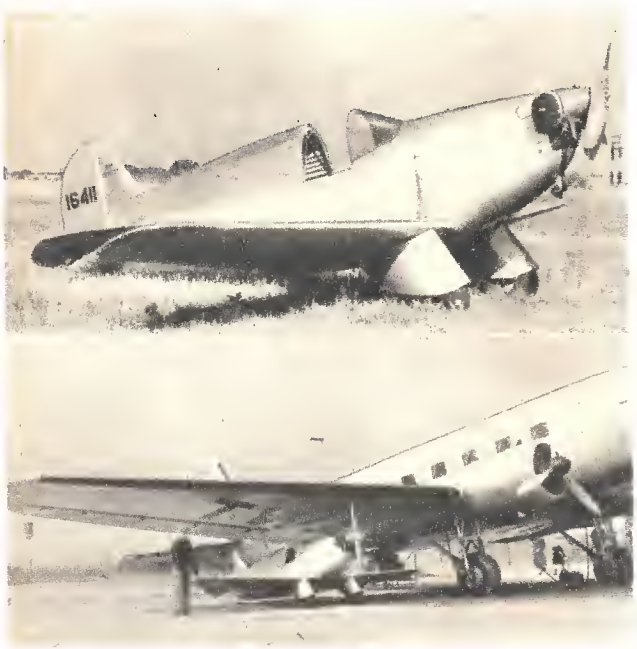
Although no such claims have been made officially, it is said that the new aircraft is capable of maintaining flight while using only one engine, increasing the plane's safety factor considerably.

Sailor Is "Water Salesman"

NEAR the top of the list of unusual occupations is that of "Skipper" Joe Hanson, who makes his living by selling ordinary drinking water to yachts and pleasure boats passing along the East River in New York. Selling the water at one-half cent per gallon, Hanson services yachts owned by such prominent men as J. P. Morgan, Vincent Astor and Walter Chrysler.

Making a living by selling water to yachts passing along the East River in N. Y. City is the novel occupation of "Skipper" Joe Hanson. Note the flag sign atop the cabin of his launch.

Home-Built Plane Goes 40 Miles On Gallon Of Gas



Wayne Dalyrimple's home-built plane is dwarfed when set beneath a transport plane's wing, but it speeds through the air at 120 m.p.h. Close-up view shows plane's trim lines.

SO SMALL that it easily stands beneath the low wing of a Douglas transport plane, a home-built airplane constructed by Wayne Dalyrimple, an engineer for the Stearman Aircraft Co., of Wichita, Kansas, has proved its efficient design by winning races at local airports, traveling 120 m.p.h. Carrying one person, the plane averages 40 miles per gallon of gasoline and has a comfortable cruising range of 300 miles.

Powered by a 30-horsepower Aeronca engine, the tiny plane cruises at 100 m.p.h., lands at 46 m.p.h., and climbs 750 feet per minute. The wing of the home-built plane has a span of twenty feet, eight inches, and is of unique construction, having only one spar and featuring full cantilever bracing. Overall length is 14 feet.

"Cockroaches" Clean Streets

FEATURING light construction and pneumatic tires that enable them to be operated on sidewalks as well as roadways without damaging the concrete, a fleet of unusual looking street-sweepers has been ordered from a Cleveland, Ohio, manufacturer for use in South America. Because of their odd appearance, the South American purchasers have named the machines "La Cucaracha", which means "The Cockroach".

For street-sweeping purposes, South American officials ordered a fleet of machines like the one shown here. Oddly, each machine is named "La Cucaracha" (The Cockroach).

Bike-Boat Steers Like Auto

Using a 16-inch propeller, this pedal-operated boat can attain a speed of 10 m.p.h. A comfortable seat and ease of propulsion enables operator to make long trips without fatigue.

A NOVEL type of bicycle boat steered by an automobile-type steering wheel, has been developed at Lake Geneva, Wis. Its ease of propulsion is said to enable the operator to make long trips without fatigue.

The new craft consists of a specially designed deck platform mounted on twin floats. An adjustable seat serves to bring the operator's feet within comfortable reach of the pedals that motivate a 16-inch propeller attached to a drive-shaft housed beneath the deck between the twin floats.

Lead Shields Protect Men Filming Radium Story

DURING the filming of a motion picture dramatizing the use of radium, elaborate precautions were observed to protect workers from the element's radiations. The cameraman operated behind a lead shield featuring a glass panel, while a workman who handled the radium used flexible gauntlets of fabricated lead and wool which were attached to a special observation shield of lead and glass.

Production was almost halted when the camera film became cloudy and diffused through exposure to the radium radiations but technicians were able to develop a film suitable for the job.

Seated behind a lead and glass screen, Pete Smith, popular movie commentator, checks camera angle while a technician handles radium behind a similar protective screen. Lead and wool gauntlets protect technician's hands from radiations.

Device Speeds Tire Changes

Daniel Slick exhibits the new auto wheel end axle he invented to facilitate tire changing. Wheel locks onto axle by means of four steel pins and can be removed in a few seconds.

ONE-MINUTE tire changes are said to be possible through use of a new auto wheel and axle device invented by Daniel Slick, of Superior, Wis. The wheel is quickly screwed onto the axle, using a three-quarter turn, and a knob on the outside of the wheel controls four steel pins that hold the wheel firmly on the axle. A safety lock on the knob provides an added protection against the wheel coming off while driving, but does not interfere with the speed or ease with which the wheel can be removed.

Model Vessel Aids Tourists

A ONE-THIRD scale model of the original *Mayflower* is being used as a novel information booth on the court house lawn in Plymouth, Mass. Seated on the deck of the ship in true Pilgrim costume, Miss Gladys Cobb supplies information to hundreds of visitors daily. Tourists from forty states have registered at the model ship.

The scale model vessel was built from plans of the original *Mayflower* and is built over the chassis of a truck so it can be wheeled around. Local residents claim the model is the most photographed ship in Massachusetts due to its historical significance.

Visitors from forty states have registered at this scale model *Mayflower* information booth located in Plymouth, Mass.

Stamps of Many Nations Commemorate Graf Flights

by
Montgomery Mulford

AFTER eight years of uninterrupted service, the great dirigible *Graf Zeppelin* ends her career. On June 8, 1937, the *Graf* returned to Frankfort to be decommissioned. Not being suited for helium, and Germany planning to use that gas in its Zeppelins, the *Graf* has ended its service. Its record is enviable.

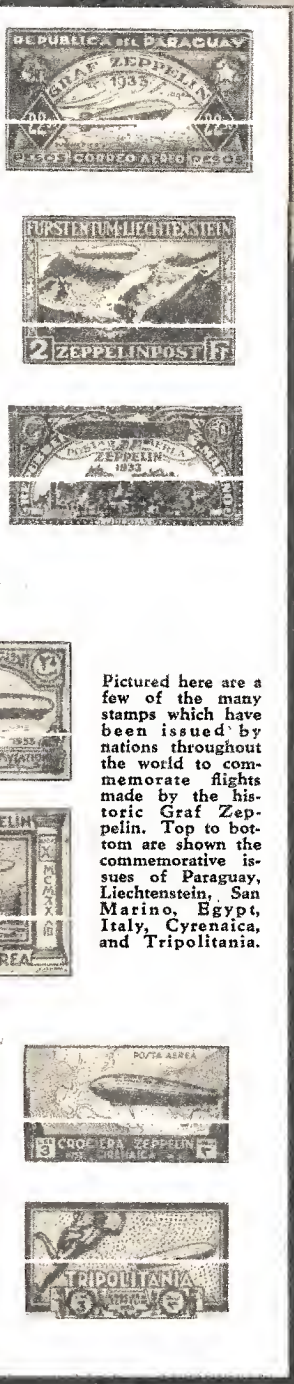
A total of 590 flights was made by this tremendous ship of the air. The trips started in 1928, and until the *Graf* was flown back for the last time, it had alone made 143 sailings over oceans!

Any stamp collector can make an excellent stamp record of the *Graf*, since more countries have honored this airship than any other flying craft. Some representative stamps honoring and picturing the *Graf* are shown here. Its first flight was on the early morning of October 11, 1928, from Friedrichshaven, Germany. The day following, the *Graf* passed over Madeira, and two days later was floating over Bermuda. Thence she came to the United States, visiting the capital city, and coming to New York via Baltimore and Philadelphia, having flown 6,300 miles in 38 minutes over 111 hours.

That was the beginning of the fame of the *Graf Zeppelin*, which, to this year, has not decreased. Stamps honoring this dirigible are among the most popular air-issues. Some are comparatively scarce, too.

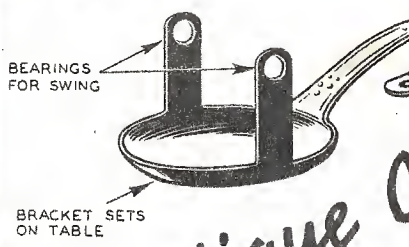
The last visit to the United States was made in 1933, for the Century of Progress Exposition held in Chicago. Today, many stamp collectors are completing albums of *Graf Zeppelin* airmail postage stamps and covers. A blank album devoted to this single ship of the air, properly mounted and annotated,

[*Continued on page* 124]

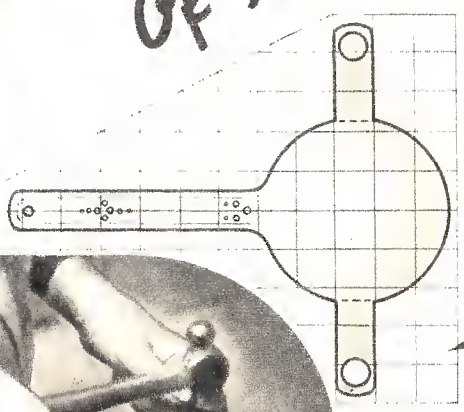


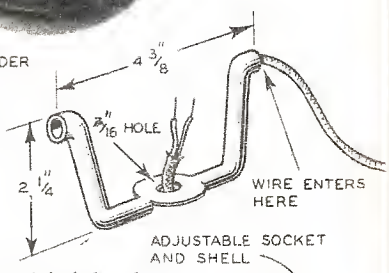
Pictured here are a few of the many stamps which have been issued by nations throughout the world to commemorate flights made by the historic Graf Zeppelin. Top to bottom are shown the commemorative issues of Paraguay, Liechtenstein, San Marino, Egypt, Italy, Cyrenaica, and Tripolitania.

An Antique Candle Bracket Of Hammered Brass

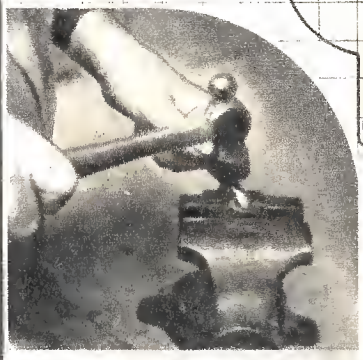


Hung on a wall or placed on a table, this antique lamp always remains in upright position.





The swing is formed from a 7-inch length of 1/8-inch brass tubing. Center portion of tube is split and hammered out flat.

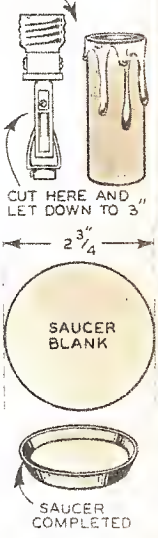


The tubing is bent to shape by inserting it in a length of pipe held in the vise jaws. Below—Hammering the saucer to shape.

RADIATING the charm of the early Colonial period, this hammered brass candle bracket lends itself to many applications. The ingenious construction of the candle holder permits the light to be hung up on the wall or placed on a table. Regardless of the position in which it is used, the candle always remains in upright position. The candle bracket can be used as a bed, desk or utility lamp.

The base or bracket is laid out on 18 gauge soft sheet brass, and cut to shape with the tin shears. The circular portion is hammered into a saucer shape and the two side lugs are bent upright with a 1/16-inch hole drilled in the end of each as shown. A small hole is drilled in the end of the handle for

[*Continued on page 140*]



This outdoor illuminated decoration is built of wallboard. Colored Cellophane is attached behind the cutout greeting.

This brilliant outdoor decoration can be inexpensively constructed from wallboard, as described in the inset detail at left. The scenes are painted with showcard colors.

Unusual Holiday Decorations

IT IS perfectly easy to transform the home into a sparkling spectacle during the holiday season, using a few simple and inexpensive home-made devices which are lighted with electricity from the house circuit.

Among the materials that the home lighting display builder will find invaluable are crinkled aluminum foil, as a covering for lighted surfaces; composition or wall board, for making cutouts of scenes or words of holiday greeting; translucent fabrics, colored Cellophane, cel-o-glass, colored gelatin, or crepe paper to cover openings which are lighted from behind by one or more lamps; glass, plastics, festoons of colored lights, strings of tree lamps, laurel or evergreen roping and home-made candles or floodlights. These are used in building colored stars, multiplane scenes, in decorating trees or revealing, in a new beauty, the architectural element of the home with color and light.

At small expense the home may be made to sparkle inside and out with vari-colored lights and glowing displays in true holiday spirit in either a simple or brilliant array.

First, there is the ever-present evergreen tree to decorate. The many new types of tree lamps make possible a variety of interesting decorative effects, including the electric candle—a small white candle with a tiny electric lamp whose filament sparkles with all the warmth of the old-fashioned taper; the luminous candle, made in series and in multiple types which glows from tip to base with cheery color and a multi-type pine-cone lamp.

The white or green tree, decorated with tinsels but no lamps can be made a beautiful spectacle by bathing the tree with floodlight. Two candles are constructed, and also a light-wooden frame, weighted at the base, covered with sheets of cardboard and painted red. Actual candle grease is used to form the drip on the sides. Three lamp sockets, equipped with inside frosted or colored lamps, are fastened to the frame work on the inside, as illustrated, and flame-shaped 25-watt flame tinted lamp located at the top. Placing the open side of the candle toward the tree floods it with light. If the tree is large, two candles, from different sides, may be used. Using different colors in each, interesting shadow and color effects are produced on the tree and

Housetop illuminated tree is formed with stringer lights. A 6- or 7-ft. vertical pole serves as support for the thin wires outlining tree.

Floodlights of various colors produce unusual decorative effects and may be effectively hidden in tree limbs so as not to be noticed. Details of the housetop illuminated tree are shown in inset. The reindeer and sleigh are of wallboard.

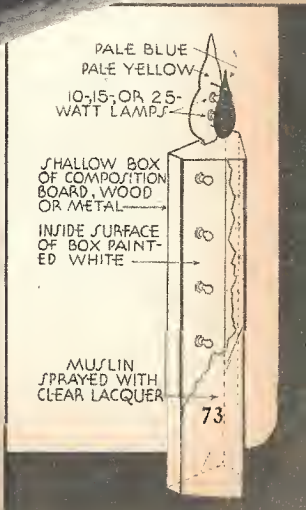
For The Home

by Earl W. Gage

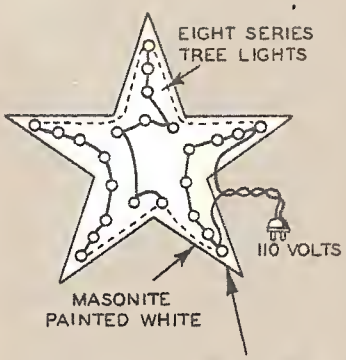
walls. A white tree covered with strings of silver foil, and floodlighted in blue from one side and amber from the other, provides a beautiful effect. The amber lamps should be half the wattage of the blue lamps.

It is easy to build large candles on wooden frames, covered with translucent material. These may be built in half or full cylinders, each with a socket at the top and bottom for lamps and a small reflector which can be made out of sheet tin. The flame-shaped lamp and candle drippings at the top complete the illusion, while a Cellophane cover gives the shiny, frosty appearance. These candles can be used to create many interesting effects in the home, at the mantle, in the entrance hall, at windows or in combination with wreaths.

The cutout of a Christmas scene or a greeting, "Merry Christmas and Happy New Year," may be used indoors or out. It is possible to make cutout multiplanes from four or five pieces of wall board, shaped and colored differently, so as to produce a brilliant holiday scene. Cutouts may be used


PALE BLUE
PALE YELLOW
10-15-OR 25-WATT LAMPS
SHALLOW BOX OF COMPOSITION BOARD, WOOD OR METAL
INSIDE SURFACE OF BOX PAINTED WHITE
MUSLIN SPRAYED WITH CLEAR LACQUER

Giant candles form a distinctive type of doorway decoration as the above photo shows. Construction of the candle is shown in the detail at right.



Large illuminated stars may be cut to shape on a jig saw, holes for inserting tree lights provided and sockets wired as shown in this detail.

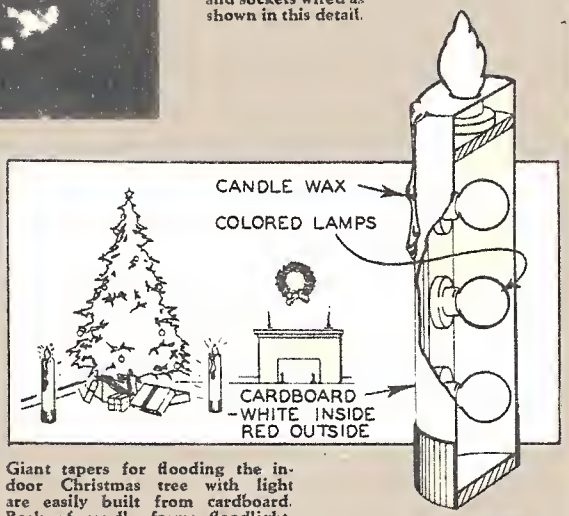
indoors, fastened to the wall with a board framework supported by small braces. Colored lamps enhance the scene, the cords being concealed along the edge of the window or door. The board may be concealed by artificial snow.

Large luminous candles may be placed in dark corners, combined with a continuous garland of evergreen draped around the room at the ceiling. Or, they may be used for lighted decorations, such as cutout evergreen trees, made of two or more planes of cardboard. Colored lamps of 25 watts can be used to provide light, beauty and novelty. Paint the surfaces of the cardboard white, then apply clear shellac and dust with artificial snow.

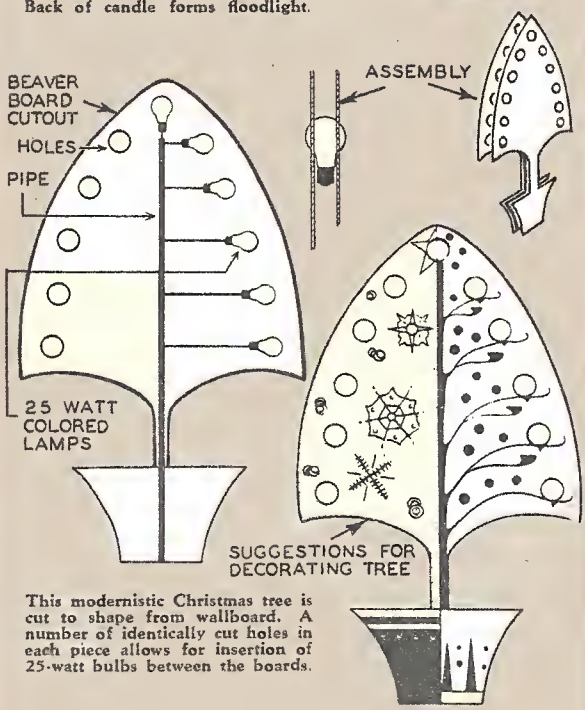
Christmas shields may be made to cover wall brackets, using cardboard and a pot of paste. The chandelier may be covered with a new dress for the holidays, using evergreen studded here and there with colored lamps of the series type. A special socket adapter permits use of the regular lamp with shade.

The living or dining room may easily be transformed into a "snow storm" scene. Stretch strong, white cords near the ceiling, from the four corners to the chandelier, or diagonally from corner to corner. Intermediate strings make the "storm" more dense. Suspend from the cords, at 6-inch intervals, "snow flakes" of small cotton puffs. The strings of puffs are suspended from white threads of varying lengths, as close together as possible. When illuminated, the cotton puffs give the effect of falling snow. Homemade spotlights may be made of coffee cans,

[*Continued on page* 124]



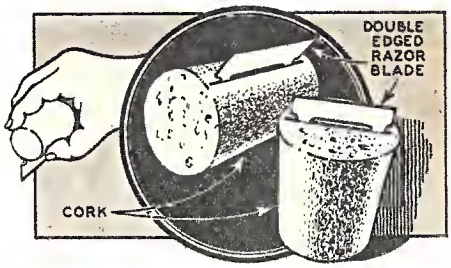
Giant tapers for flooding the indoor Christmas tree with light are easily built from cardboard. Back of candle forms floodlight.



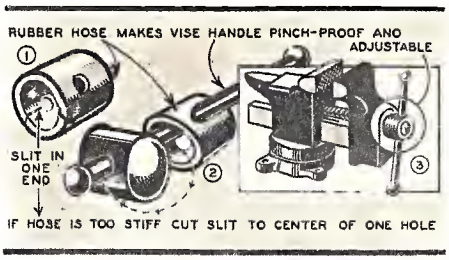
This modernistic Christmas tree is cut to shape from wallboard. A number of identically cut holes in each piece allows for insertion of 25-watt bulbs between the boards.

NEW WRINKLES FOR THE HOME MECHANIC

Corks Form Handy Blade Holders



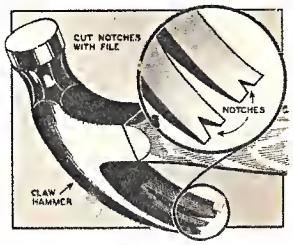
OLD double-edged razor blades are very useful around the home workshop except for the fact that they are hazardous to handle. By inserting the blades in large corks this inconvenience can be overcome so that the sharp cutting edge of the blade may be used for all kinds of scraping work and for shaping model fittings.—H. Albert.


RUBBER HOSE MAKES VISE HANDLE PINCH-PROOF AND ADJUSTABLE
SLIT IN ONE END
IF HOSE IS TOO STIFF CUT SLIT TO CENTER OF ONE HOLE

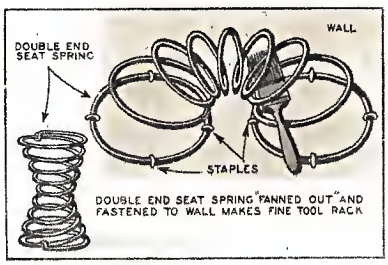
Vise Handle Made Pinch-Proof

A SHORT length of automobile radiator hose slipped over the head of the vise screw will prevent pinched fingers caused by the handle accidently dropping down. Cut holes in each side of the hose, large enough to accommodate the handle and fit in place. Slit one hole so that the hose may be forced over the end of the handle.—P. Sley.

Notched Jaws Increase Use Of Hammer



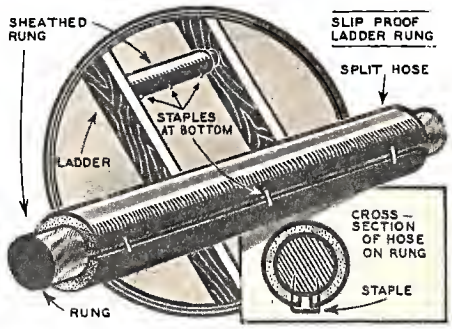
THE usefulness of a claw hammer may be increased considerably by notching each claw so that the hammer may be used for pulling tacks and small finishing nails. Notching is accomplished through the use of a small three-cornered file. File the slots at an angle so that the resulting claws will firmly grip the nails.—P. E. Harvey.



Seat Spring Serves As Brush Holder

OLD double-end seat springs, such as can be had for the asking at any auto graveyard, make convenient holders for paint brushes. Tack the spring to a block of wood with staples in the fan-shape shown in the accompanying illustration. Select a spring having a large number of coil turns, mounting the ends of the spring as closely together as possible.—Harvey Paisley.

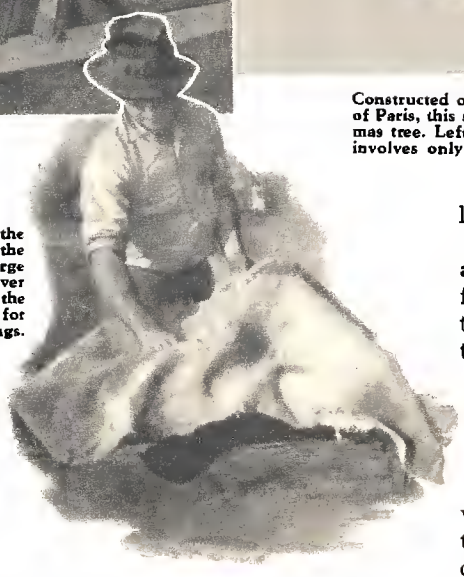
Hose Increases Ladder's Safety



AS WORN rungs make ladder climbing treacherous, lengths of old hose cut up, slitted and secured to the rungs with staples will make the most dangerous ladder once more safe for climbing. Cut the hose up into lengths exactly identical to the inside width of the ladder so that the hose, when slipped over the rungs, will fit tightly. Drive the staples over the split section of the hose so that it holds both sides securely to the rung.—H. Edmont.

Make This Picturesque

Constructed of scrap lumber, burlap and plaster of Paris, this scenic base will enhance any Christmas tree. Left—Forming framework of the base involves only the use of a hammer and a saw.



After completing the lath frame of the base, arrange a large piece of burlap over it to determine the location of holes for two tunnel openings.

AN ARTISTIC base for a Christmas tree will add greatly to its beauty, and to the enjoyment of the tree which exemplifies the Yuletide in nearly every American home. Such a base, resembling snow covered mountains, can be made in a short time at little cost.

The stand can be made to any size desired. It need not be made of planed lumber; scraps can be used. A base 3 feet square is desirable because it does not extend past the limbs of the tree. Take a ¾ by 4 inch board and cut four pieces so that when nailed together they will form the desired outside dimensions of the base. If a 3 foot square frame is selected, cut two boards, 3 feet long and two boards 3 feet, 1½ inches long, to allow for overlapping at ends so they can be nailed together.

Cut another piece of lumber 3 feet long and mount it 1 foot in from one side of the frame. Another piece 1 foot long is nailed to the outside board and the inside board to form a 1 foot square opening in one corner. This is to act as a base for nailing in the tree holder.

The tree holder is made of the same size board. Four pieces, each 1 foot long, are nailed edge to edge to form a holder with an almost square opening. This is fastened with nails to the inside intersection of the two boards which form the square in one corner.

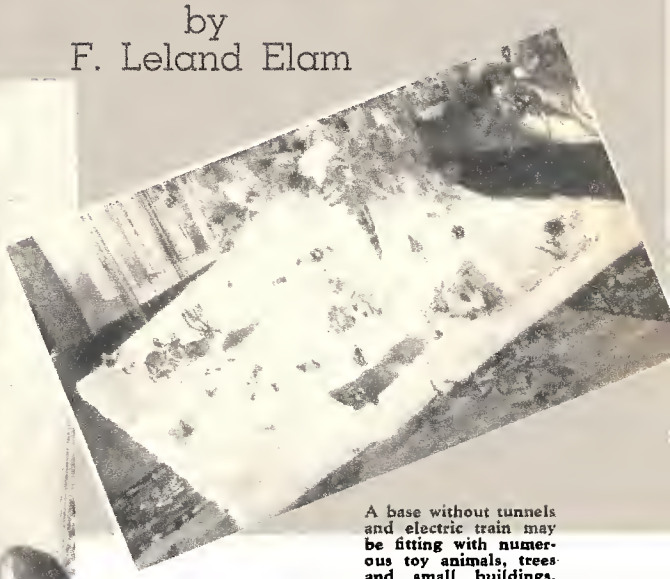
The shape the stand will take, when the outer covering is mounted, depends upon how the built-up boards are mounted. Pieces of laths are best for this. To build the slopes up to the tree holder, fasten laths from the outside board to the top of the holder, at the back and on the sides, as desired. A board placed from the front corner, where the tree holder is mounted, to the opposite corner formed by the long inside board, is the base for nailing the lath which continues up to the tree holder.

Other laths nailed from the outside board to the board mounted crosswise provide a flat surfaee in front of the tree mount. If additional slope is wanted toward the tree

Christmas Tree Base

by
F. Leland Elam

Tiny tots will thrill at the sight of a Christmas tree base such as this one. Construction is simple.



A base without tunnels and electric train may be fitting with numerous toy animals, trees and small buildings.

holder or the outside edges, laths can be nailed from a lower board to ones sloping toward the holder.

When the stand is completed, life can be added to it by installing a toy train track on it. It is desirable to have the track extend into tunnels on opposite sides of the stand. The tunnels must, of course, be mounted before the plaster covering is applied. Form the tunnels by folding a piece of tin to the desired size and shape. A flat bend at either end will provide an edge for nailing to the board, which is mounted crosswise. The track is not mounted until later.

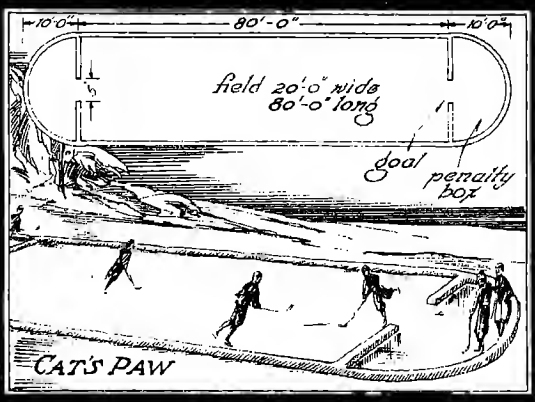
The next step is to take a piece of burlap, or sacks sewn together, and fit it to the stand. It should be large enough to allow for fitting into the design formed by

[*Continued on page* 130]

After determining the tunnel openings, dip the burlap in plaster of Paris, arrange it on the framework and build up low places with hands full of plaster as shown at left.

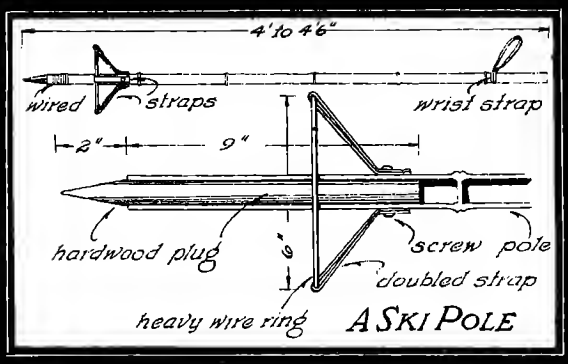
WINTER SPORTS PROJECTS

by G. Everett Van Horn

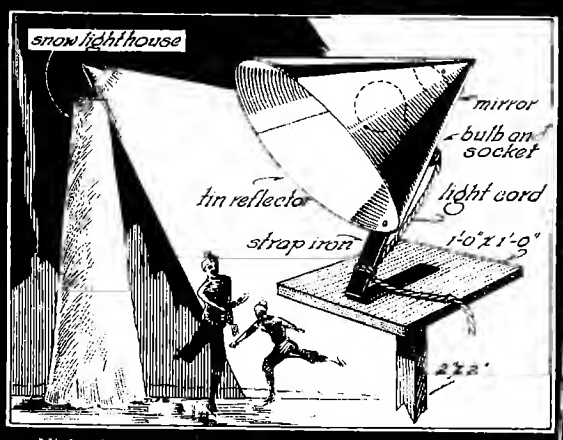


This game combines ice hockey and tag. The field is laid out to the dimensions shown. Any number of players can participate. The object of the sport is to drive the pucks into the opponent's goal to score 5 points. A player tagged by an opponent is retired from the game. Players may set a time limit for the game which is played in quarters.

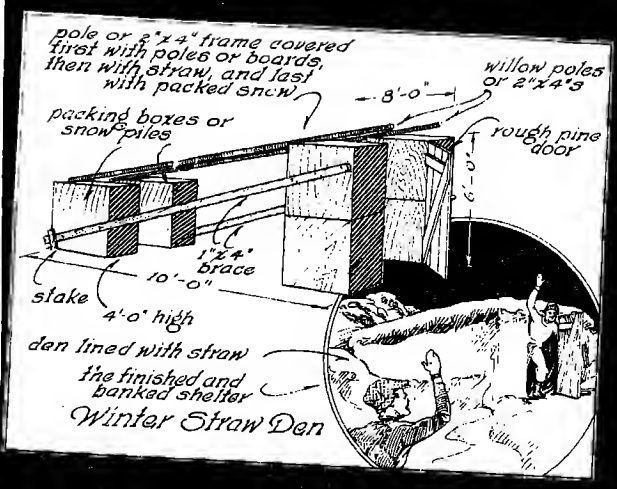
The ski pole (below) is made from a 1¼-in. by 4½-ft. bamboo pole. A pointed hardwood peg is driven in one end and secured with bale wire. The ring is formed to 6 in. diameter from heavier wire and attached to pole with leather straps. To facilitate carrying the pole, attach a wrist strap.

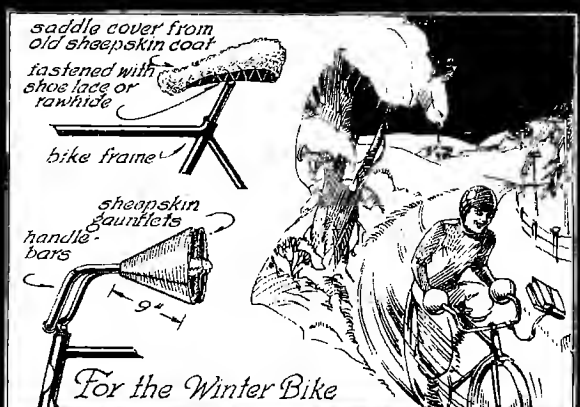


The straw and snow hut shown below will provide the ice fisherman with excellent protection against winter blasts. Packing boxes and willow poles form framework of hut. The frame is first covered with straw, followed with a packing of snow.



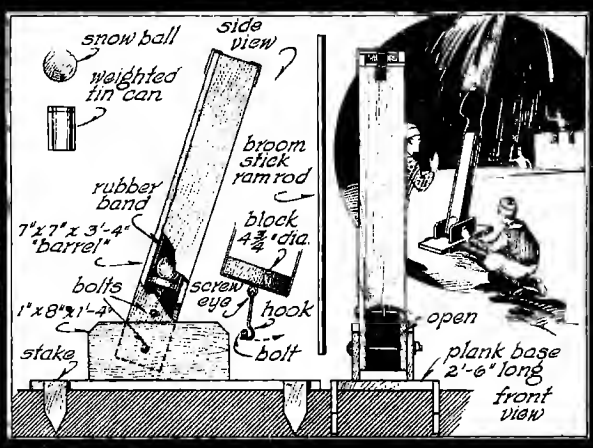
Night skaters will appreciate this snow tower floodlight. The tower is a tall mound of snow which has been well packed. The reflector is formed from bright tin and mounted on a wooden base. A pointed post supports it on the top of the snow mound.



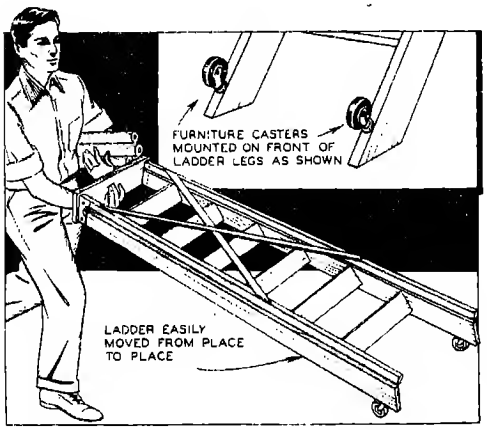


78 The winter cyclist will welcome these riding comforts, made from scrap pieces of sheep skin. Both gauntlets and saddle cover are cut to shape from burlap patterns. Stitch all seams with heavy waxed thread and secure saddle cover with lacers.

The snowball mortar described below will provide youngsters with the necessary artillery for staging an exciting sham battle. The barrel is fitted with a rubber band catapult for firing the snowballs as indicated in details.



Timely Household Short-Cuts



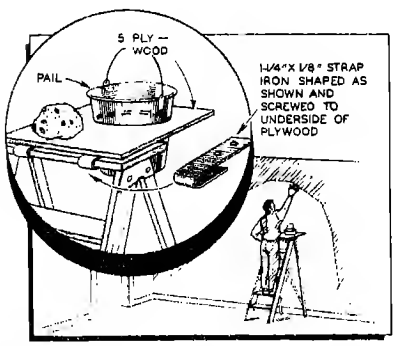
Ladder Moving Is Simplified

BOTH the handy man and housewife will appreciate this clever method of transporting a cumbersome step-ladder from one part of the home to the other. By fitting the front upright pieces of the ladder with a pair of furniture casters, the heaviest ladder can be rolled to the place where it is needed without the user exerting strenuous effort.

With the aid of a brace and a suitable bit, drill a hole at the bottom of each front upright for the casters. Make certain that the holes are low enough so that the ladder can be tilted to a convenient position for rolling.—A. Waychoff.

Pads Prevent Sticking Of Ice Trays

PRACTICALLY every owner of a mechanical refrigerator has at some time or other experienced difficulty in removing ice trays from the freezing chamber. This disagreeable annoyance can be overcome by cutting pads from an old inner tube to the exact size of the tray, and inserting them in the shelves of the freezing chamber. A slight tug will at once free the trays from the rubber pad, making their removal extremely simple.—A. H. Tempe.



Pail Holder Attaches To Ladder

A REMOVABLE pail holder that can be attached to any step-ladder is a device that every housewife will greatly appreciate. The holder is simply a piece of 5-ply veneer having a circular opening 1 inch smaller than the top diameter of the pail. A pair of strap iron brackets attached to the veneer panel. They permit the pail holder to be securely held to the top step of the ladder when in use.—F. Doughty.

Notched Brackets Balance Coal Hod

A COMMON fault of the ordinary coal hod is that its balance is usually disrupted when it is filled to the top with coal. To overcome this, remove the original bail brackets and replace them with a pair of notched brackets formed from 1-inch strap iron. Bend them to the shape shown in accompanying detail and bolt or rivet to the side of hod. With the improved brackets, it is a simple matter to balance the hod.—A. S. Wurz, Jr.

The short, chunky, deep-chested man should select a gun with a 13¾-in. stock, having a heel drop of 2¼-in.

How To Select

THERE is a belief, sometimes expressed, to the effect that certain individuals are able to pick up most any sort of shotgun, light or heavy, any gauge, and with varied length of stock, drop at heel, comb and pitch of barrel, and do as excellent work with it as any other gun. It would be logical to demand proof when such assertions are made. So far, it has been impossible to find a shotgun devotee who has been able to prove the conclusions just stated. The fact remains that if one wants to get the most out of a shotgun, it must be more or less carefully fitted to his requirements, physical and otherwise, else the results from the use of the weapon will be questionable in the extreme.

Comparatively few shotgun users have ever taken serious note of just how the gun they are using measures up to demands. If they are consistently missing game, blame is placed on the shells, the barrel, or the make of the gun. Some other gun and shells, they feel, would change things completely. Probably in some instances the gun and shells may be at fault, but not always. There are other things that must be considered. The stock of the gun and the drop at heel and comb must be taken into consideration when purchasing a gun. Unless your gun fits you in every way you cannot expect to go out and do worthwile shooting with it.

If all persons using a gun were built alike,

PITCH
THE COMB, AND DROP AT SAME
STOCK IS MEASURED FOR LENGTH FROM TRIGGER TO CENTER OF BUTT OF STOCK
TOE OF STOCK
HEEL OF STOCK AND ITS DROP

By standing a gun against a perfectly vertical wall, the pitch, heel and comb drop can be quickly determined.

For successful hunting a gun must be selected with care. The game displayed by these hunters provides ample proof of this fact.

guns could be made identical. But there are short men, tall, stout, medium and lean men; some with long arms and some with short arms. To believe that one certain cut of shotgun will do for all of these individuals is asking a great deal. Take the comb of the shotgun as an example. If the shotgun has a thick comb and the man shooting it is a person with jowls or outstanding cheeks, the tendency is invariably to throw the gun out of line, in which case the shot will go to the left. To bring the gun in line, such an individual must have a stock with a thin comb; in fact he may even have to have a special stock thinned down for him to suit his requirements before he will be able to do any

Because of increased muzzle blast heavy-load hunting guns require a longer barrel than guns of average load. Left—These upland hunters are equipped with guns having 28-inch barrels.

A Shotgun

by Robert Page Lincoln

Facts that every sportsman should know when he is buying a shotgun.

real shooting. On the other hand, if the shooter has a thin or sunken cheek the direct opposite will be the case if a thin comb is used. He will shoot to the right. To remedy the situation he must have a thick stock to keep the gun in line. It is strange how little attention is ever given this matter of the proper stock. It is an adequate explanation for much poor shooting.

Another qualification rarely considered in

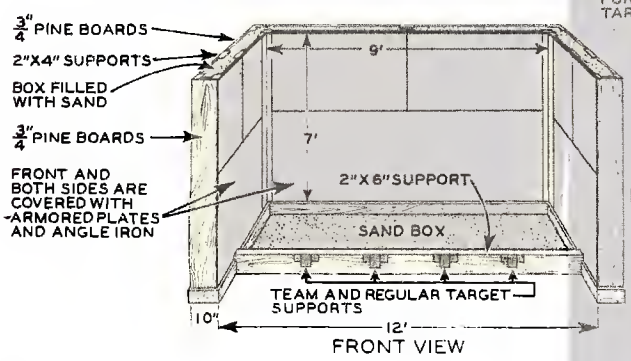
[*Continued on page* 120]

This hunter is using the popular pump-gun, which functions best with 28-inch barrel length.

INDOOR RIFLE RANGE FOR SPORTSMEN

THE construction of the range is very simple yet it serves the purpose for clubs whose members wish to improve their marksmanship and for training before the hunting season. The resounding ring of bullets striking the steel back plate or sides has been deadened by enclosing the steel plate with framework and leaving a space ten inches in width and seven feet in depth which is filled with sand. Another helpful feature is the indirect lighting system, all light being reflected from an overhead frame which can be lifted and moved to the desired distance from the targets so that no shadows or bright lights bother the one who is firing.

All the steel plate needed can be purchased from a scrap metal dealer or junk yard at a reasonable price. It need be no thicker than a quarter of an inch. The range may be painted either black or dark green. The latter color is recommended as more suitable because it is restful to the eyes. The reflecting tin can be obtained at a foundry at a slightly higher price or empty five gallon gasoline tins can be cut to the required size. Six, one hundred watt bulbs have been found to give more than ample illumination.



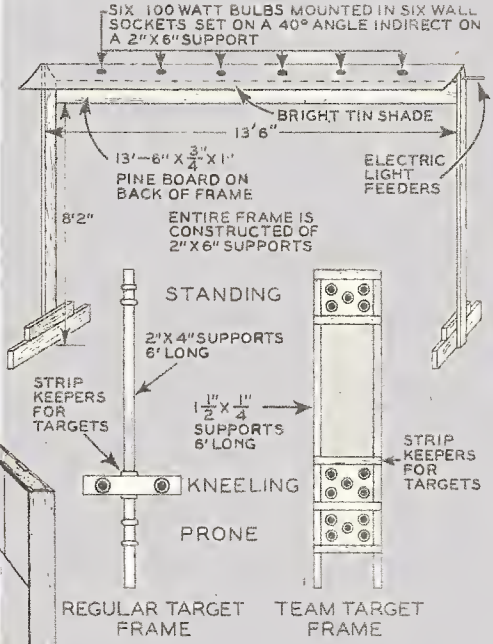
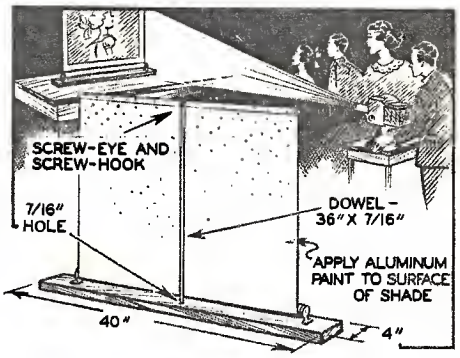

SIX 100 WATT BULBS MOUNTED IN SIX WALL SOCKETS SET ON A 40° ANGLE INDIRECT ON A 2"X6" SUPPORT
BRIGHT TIN SHADE
13'6"
13'-6" X 3/4" X 1" PINE BOARD ON BACK OF FRAME
ELECTRIC LIGHT FEEDERS
8'2"
ENTIRE FRAME IS CONSTRUCTED OF 2"X6" SUPPORTS
STANDING
2"X4" SUPPORTS 6' LONG
STRIP KEEPERS FOR TARGETS
1 1/2" X 1/4" SUPPORTS 6' LONG
STRIP KEEPERS FOR TARGETS
KNEELING
PRONE
REGULAR TARGET FRAME
TEAM TARGET FRAME

Photo shows the indoor range ready for use. Below are constructional details for builder. Six 100-watt bulbs were found to give ample illumination. Back and sides are designed to remove most of the noise caused by striking bullets.

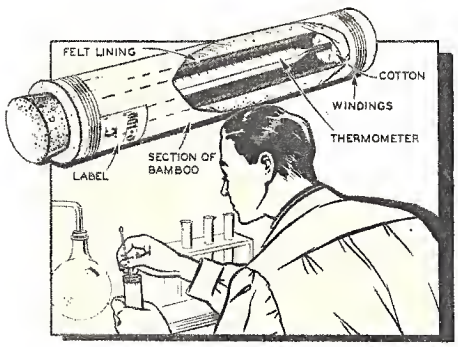
New Ideas for the Handy Man

Window Shade For Movie Screen

A WINDOW shade that is no longer suitable for use in the home can be made into a handy collapsible home movie projection screen. A 35-inch shade is best suited for the purpose. Mount it on a 1 by 4 by 40-inch board with regular shade hooks. Drill a $\frac{7}{16}$-inch hole in the exact center of the plank and insert a 36-inch dowel. A screw-hook is inserted in the end of the dowel for attaching the shade. Complete the screen by spraying it with aluminum bronze paint.—H. A. Bowman.



Delicate Thermometers Protected

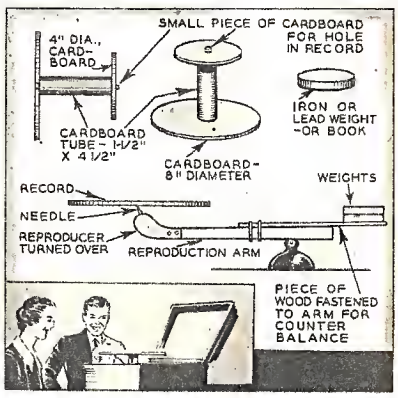


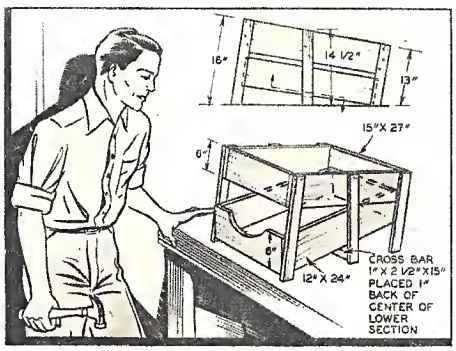
DELICATE thermometers such as used for home medicinal or scientific purposes can be protected against accidental breakage by placing them in a rigid case when they are not being used. Such a case can be easily made from a length of bamboo cut off between the ribbed sections. Line the inside of the bamboo with cotton or felt padding and secure it with glue. Force a wad of cotton into the closed end of the tube and fit a cork into the opposite end to complete the case.—C. B. A. Kean.

"Scrambled Music" Is Novel Stunt

THIS clever stunt is certain to add new life to any party or family gathering. Simply by inverting the records and reproducer head of a phonograph it may be used for providing what might well be termed "scrambled music."

The record is placed on an elevated turntable made from a length of heavy mailing tube and cardboard to the dimensions indicated at right. Allow a short length of dowel to protrude from the top of the support so as to keep the record in its correct position.—P. R. Ronnie.


SMALL PIECE OF CARDBOARD FOR HOLE IN RECORD
4" DIA., CARD-BOARD
IRON OR LEAD WEIGHT -OR BOOK
CARDBOARD TUBE - 1-1/2" X 4 1/2"
CARDBOARD - 8" DIAMETER
WEIGHTS
RECORD
NEEDLE
REPRODUCER TURNED OVER
REPRODUCTION ARM
PIECE OF WOOD FASTENED TO ARM FOR COUNTER BALANCE



A Teeter Nest For Laying Hens

POULTRYMEN will find this mechanical hen's-nest capable of increasing egg production. The device works on a simple teeter board principle; when the hen enters, its weight causes the lower shelf to rise, closing the entrance. Assemble the nest from light stock salvaged from packing cases. The supports are attached to the upper frame and lower shelf hinged to cross bar.—T. V. Summers.

Facts About the "Caledonia"

In an effort to establish a trans-oceanic air service between England and the U. S., the "Caledonia", of Imperial Airways, made the first trip in 15 hours, 9 minutes. The return trip of 1,960 miles required only 12 hours, 5 minutes due to favorable winds. Before actual passenger flights are made, the "Caledonia" will be used to make several test crossings to check fuel consumption, meteorological and radio service.

This article tells you how to make a beautiful solid scale model of this now historic flying boat.

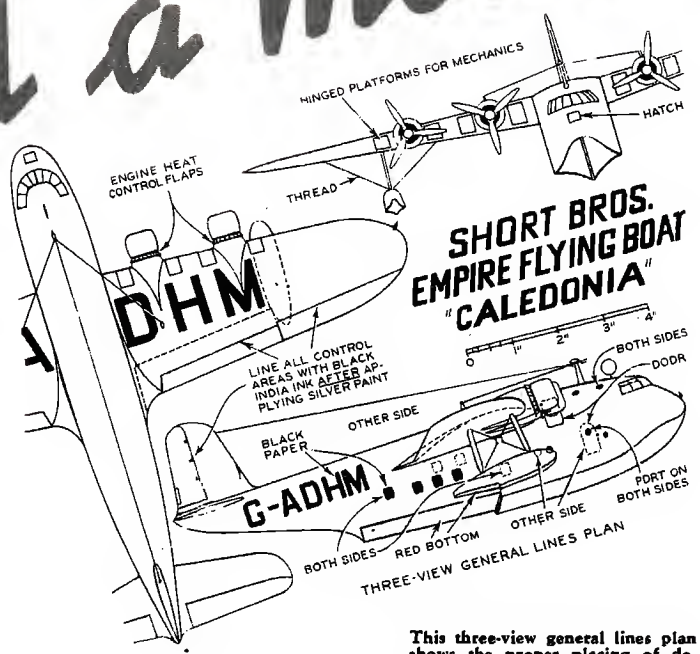
Build a Model

by Nick Limber

BRITAIN'S new sky liners have spanned the great Atlantic and have landed well ahead in the race to establish a trans-oceanic air service. This magnificent fleet of flying boats has brought the Dominion of Canada closer to the mother land than ever before and is now to be the final link between the old and the new continents.

Equipped with the latest of scientific devices, these winged clippers represent a golden harvest after 34 years of aeronautical research and experimentation. They are a triumph of aeronautical skill.

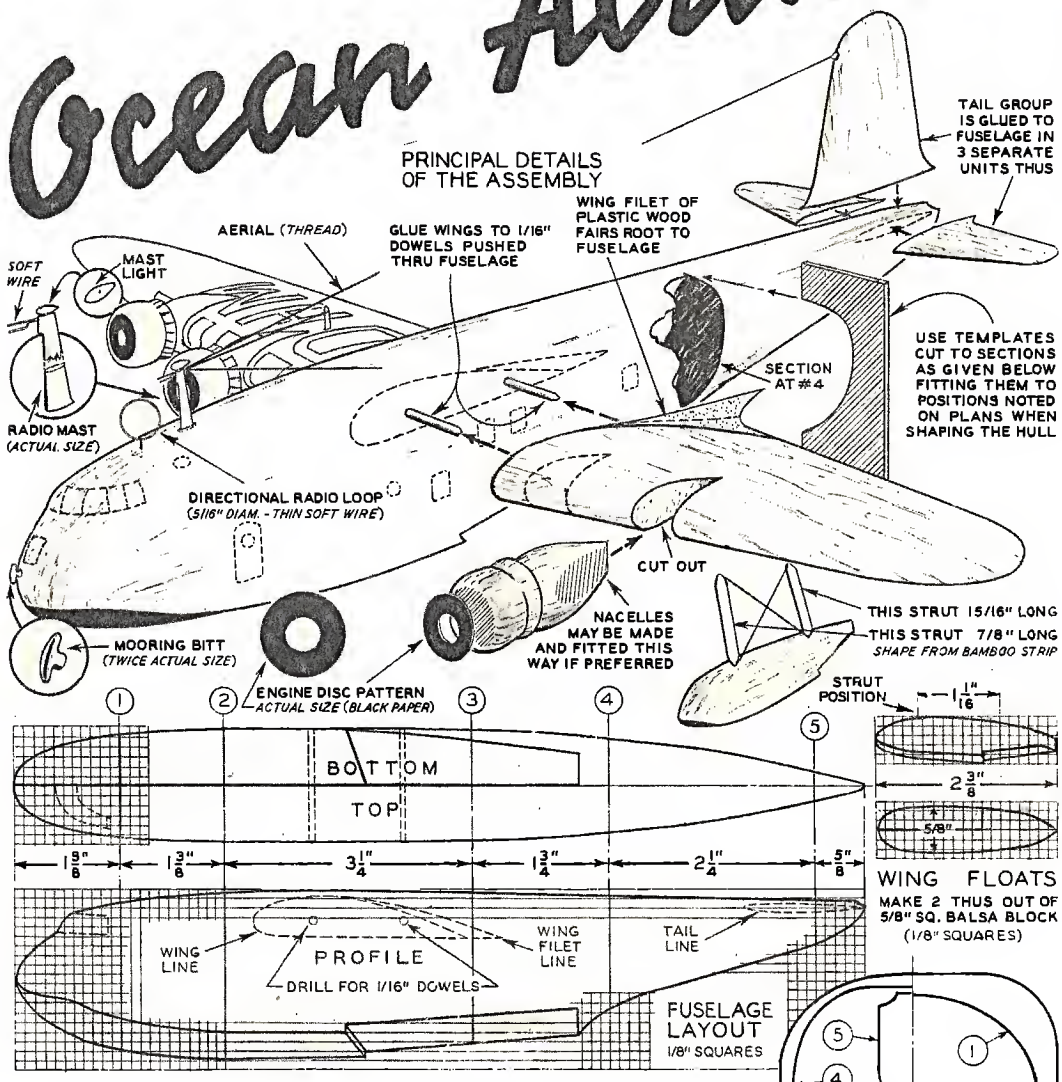
Built for Imperial Airways by Short Bros. Ltd., the boats have a wing span of 114 feet and an overall length of 88½ feet. They are powered with four Pegasus engines, similar to that used in the altitude-record holding Bristol 138A, and maintain a maximum speed of 200 m.p.h., cruising at 165 m.p.h. They are designed to accommodate 24 passengers as a day liner and 16 as a sleeper. Each ship is manned by a crew of 5, located in the upper deck of the two-deck hull. A promenade deck, salons, smoking lounge and model kitchen are located on the lower deck. Large windows, de luxe furnishings and a new technique in cabin design insure the passenger's maximum comfort and safety.



This three-view general lines plan shows the proper placing of details and the painting scheme. Body is finished in silver. Underside of the fuselage and the wing floats are lacquered in red.

This solid scale model of the British "Caledonia" is an intriguing project for airplane enthusiasts.

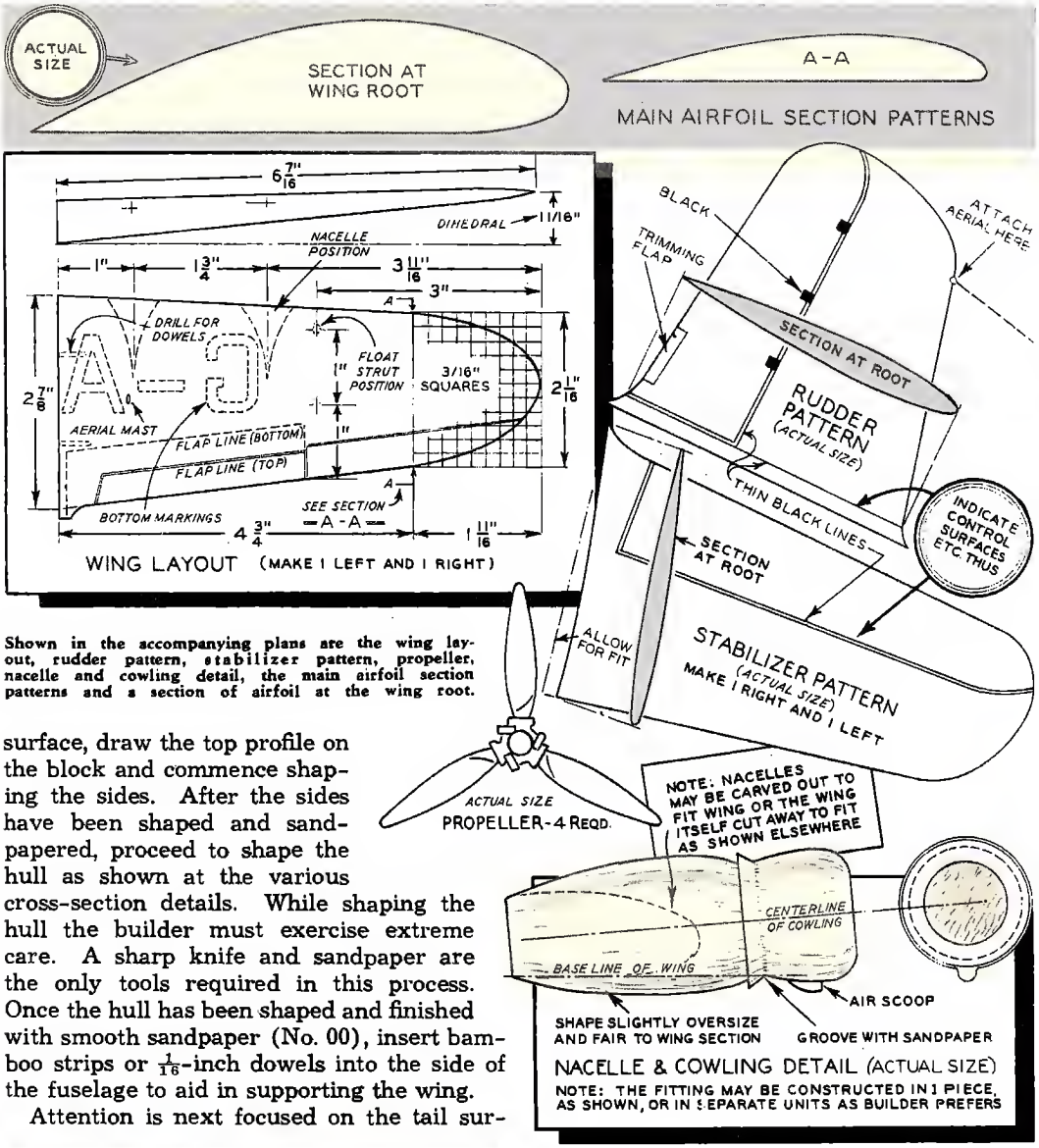
Ocean Airliner


PRINCIPAL DETAILS OF THE ASSEMBLY
TAIL GROUP IS GLUED TO FUSELAGE IN 3 SEPARATE UNITS THUS
AERIAL (THREAD)
GLUE WINGS TO 1/16" DOWELS PUSHED THRU FUSELAGE
WING FILET OF PLASTIC WOOD FAIRS ROOT TO FUSELAGE
SOFT WIRE
MAST LIGHT
RADIO MAST (ACTUAL SIZE)
USE TEMPLATES CUT TO SECTIONS AS GIVEN BELOW FITTING THEM TO POSITIONS NOTED ON PLANS WHEN SHAPING THE HULL
SECTION AT #4
DIRECTIONAL RADIO LOOP (5/16" DIAM. - THIN SOFT WIRE)
CUT OUT
NACELLES MAY BE MADE AND FITTED THIS WAY IF PREFERRED
THIS STRUT 15/16" LONG
THIS STRUT 7/8" LONG
SHAPE FROM BAMBOO STRIP
MOORING BITT (TWICE ACTUAL SIZE)
ENGINE DISC PATTERN ACTUAL SIZE (BLACK PAPER)
STRUT POSITION
1 1/16"
2 3/8"
5/8"
BOTTOM
TOP
1 5/8"
1 3/8"
3 1/4"
1 3/4"
2 1/4"
5/8"
WING FLOATS
MAKE 2 THUS OUT OF 5/8" SQ. BALSA BLOCK (1/8" SQUARES)
WING LINE
PROFILE
DRILL FOR 1/16" DOWELS
WING FILET LINE
TAIL LINE
FUSELAGE LAYOUT
1/8" SQUARES
BODY PLAN (ACTUAL SIZE)
CUT TEMPLATES TO HEAVY LINES
SECTIONS AFT
SECTIONS FWD

The model which is described here is the "Caledonia," the second to be constructed in a fleet of 29 ocean airlines.

Construction of the model begins with the fuselage, which is carved from a balsa block 11¼ by 2¼ by 1⅝ inches. Draw the side view or profile of the hull on the block and then proceed to cut away the excess wood outside of the line. After this operation has been completed, sandpaper the newly cut

The main illustration, above, shows the "Caledonia" model in perspective. Accompanying details show the patterns for fuselage, wing floats in template form.



Shown in the accompanying plans are the wing layout, rudder pattern, stabilizer pattern, propeller, nacelle and cowling detail, the main airfoil section patterns and a section of airfoil at the wing root.

surface, draw the top profile on the block and commence shaping the sides. After the sides have been shaped and sandpapered, proceed to shape the hull as shown at the various cross-section details. While shaping the hull the builder must exercise extreme care. A sharp knife and sandpaper are the only tools required in this process. Once the hull has been shaped and finished with smooth sandpaper (No. 00), insert bamboo strips or $\frac{1}{16}$-inch dowels into the side of the fuselage to aid in supporting the wing.

Attention is next focused on the tail surfaces. Both the rudder and the elevators are cut from $\frac{3}{16}$-inch sheet balsa. Streamline the assembly by first rounding the leading edges and then tapering the trailing edges. Finish with smooth sandpaper and cement to the fuselage, as shown in the diagram. Note that ambroid is used in all of the gluing operations as it is the quickest drying and best suited glue that can be used with balsa. Allow the assembly to dry in place, making certain that the rudder is vertical and the elevators horizontal.

Completed, the "Caledonia" luxury sky liner is an authentic reproduction of the ships flying the Atlantic ocean.

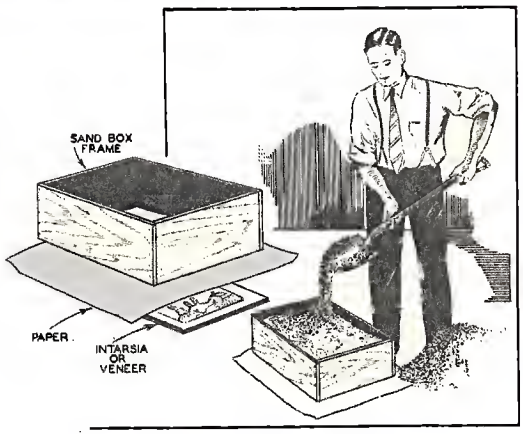
With the completion of the tail unit, begin

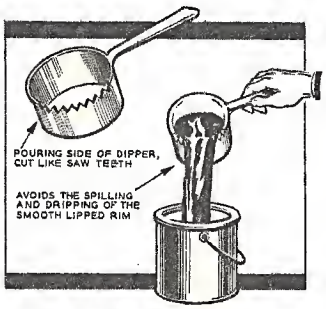
[*Continued on page 126*]

HANDIKINKS FOR THE SHOPMAN

Veneer Gluing Is Simplified

THE problem of obtaining even pressure when gluing veneer inlays and intarsia cut-outs always confronts the craftsman. To overcome this, lay the material to be glued flat on an even floor surface and cover with heavy wrapping paper. Place a wooden frame around it and pour in dry sand. Moist will not do. Tamp the sand down into the box to insure an even pressure over the entire glued area. Increasing the frame height will increase the potential pressure, but a frame eight to ten inches high will prove sufficient.—O. E. Olson.



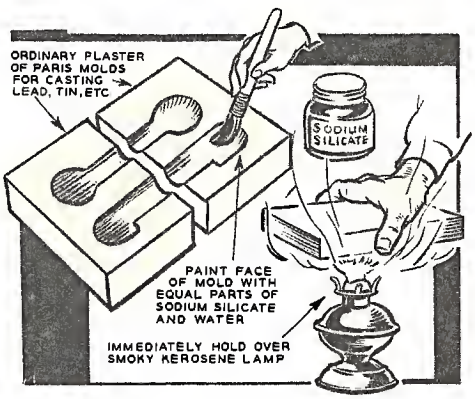


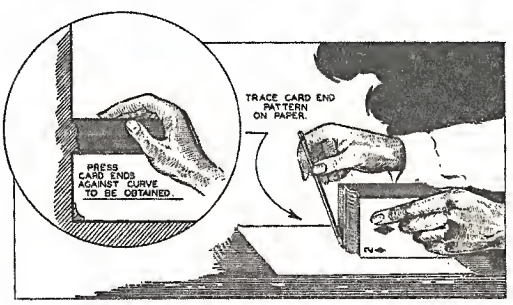
Toothed Ladle Aids In Dipping Paint

WHERE a dipper or ladle is used to convey paint, tar or other viscous liquids from one container to another, the use of a handy toothed ladle will prevent stringy drippings from forming. With the aid of a pair of tin snips, remove the rolled lip from the dipper then cut a series of vee-shaped notches along the edge to provide a saw tooth effect. The teeth will reduce the film area of the paint, actually cutting off the superfluous drippings.—A. H. Tempe.

Water Glass Aids Plaster Molds

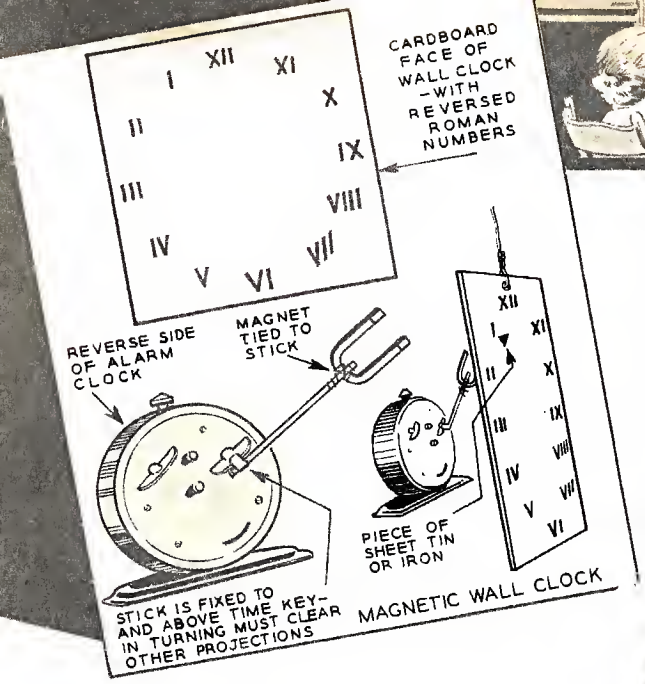
DIFFICULTIES encountered in securing good castings from plaster of Paris molds can usually be attributed to the dampness of the plaster. A proven way to seal out moisture is through the application of a solution of one part water glass and one part water to the inner surfaces of the mold. Immediately after the solution has been applied, hold the molds over the smoking flame of a kerosene lamp. After a layer of soot has collected they are laid aside to dry before being placed into use.—A. Waychoff.


ORDINARY PLASTER OF PARIS MOLDS FOR CASTING LEAD, TIN, ETC.
SODIUM SILICATE
PAINT FACE OF MOLD WITH EQUAL PARTS OF SODIUM SILICATE AND WATER
IMMEDIATELY HOLD OVER SMOKY KEROSENE LAMP



Cards Copy Unknown Curves

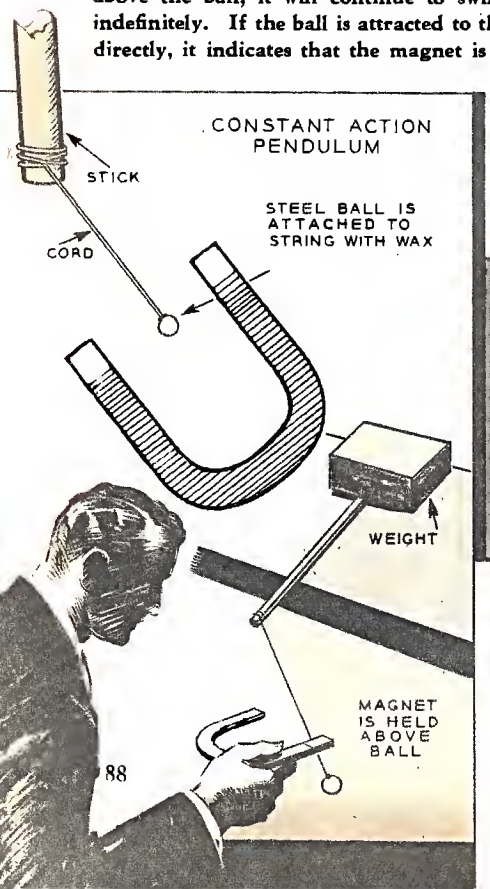
FITTINGS for curves, such as found on moldings and cornices, can be easily cut by determining their contour with a deck of cards. Stack up one or two decks of playing cards and press the ends over the molding in question. The cards will naturally follow the shape of the moldings so that the irregular hues may be traced with a pencil.

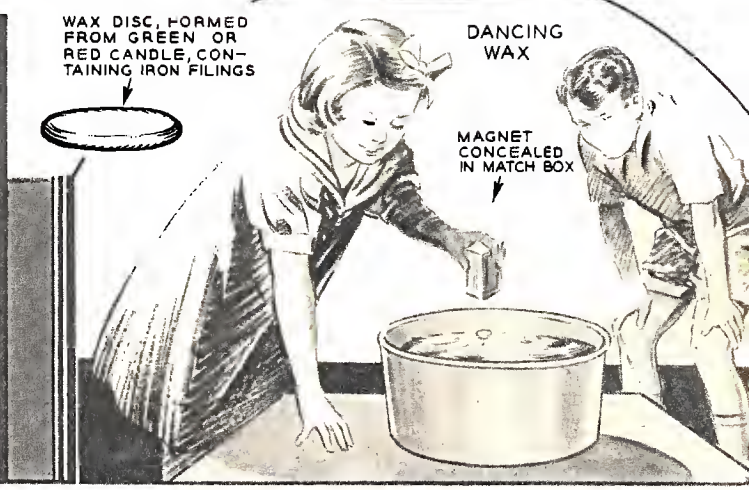

CARDBOARD FACE OF WALL CLOCK —WITH REVERSED ROMAN NUMBERS
REVERSE SIDE OF ALARM CLOCK
MAGNET TIED TO STICK
PIECE OF SHEET TIN OR IRON
STICK IS FIXED TO AND ABOVE TIME KEY— IN TURNING MUST CLEAR OTHER PROJECTIONS
MAGNETIC WALL CLOCK

MYSTERY WALL CLOCK—On a heavy sheet of square or round cardboard, place in a circle the numerals one to twelve, equidistant, and running counter clockwise. Attach a light stick to the winding key of an alarm clock. The stick should be as long as the radius of the circle around which the numerals were placed. Then attach a magnet to the end of the stick. The clock with its accompanying magnet should be placed close to the back of the clock face. A small piece of tin or iron will follow the magnet as it makes its hourly trip around the circle.

MAGIC WITH MAGNETS

CONSTANT ACTION PENDULUM—To a small steel ball, attach by means of paraffin or candle wax a piece of ordinary thin cord. Attach the free end of the cord to the end of a stick which is supported over the edge of a table by a heavy object. While the ball is swinging freely, bring a strong magnet close to it, but not on the same level. With the magnet a short distance above the ball, it will continue to swing almost indefinitely. If the ball is attracted to the magnet directly, it indicates that the magnet is too close.





DANCING WAX—Melt some wax from a colored candle onto the surface of a pan of water, to form a small disc. Sprinkle the disc with iron filings and cover with more wax. With the disc floating on the water, bring a magnet close to it and watch the disc dance around on the water's surface. The trick is more impressive if the magnet is concealed in a small match box.

by Prof. Victor Lewitus

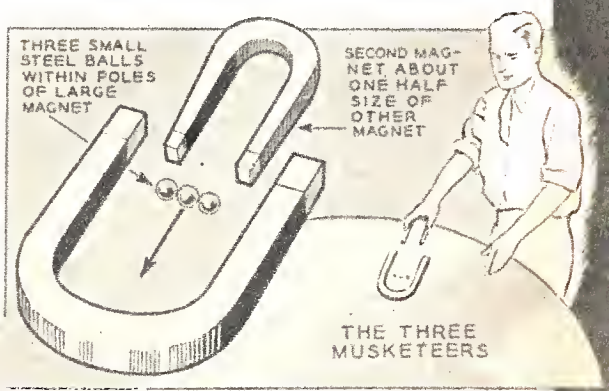
NEARLY everyone has either seen or heard about magnets, but very few people realize just how indispensable magnets of one form or another have become.

The Chinese people appear to have been the first to make use of the natural magnetic minerals which they found in certain regions, in great abundance. They discovered that the "lodestone," as it was called, was capable of attracting some things and not others.

As a result of these observations, man today has the advantages of the mariner's compass, the electric bell and buzzer, the magneto of automobiles, numerous railway signal devices, and many special surgical instruments. We must not forget to mention the telephone and the telegraph, nor should we forget that magnetism is the important factor in the production of electrical energy from the dynamo.

Our modern life is absolutely dependent upon the workings of magnetism. Without it we could not enjoy modern means of travel, be it on land or sea or far up in the clouds. Without it we could not communicate swiftly as we do from one end of the earth to the other. Without it we would be much discomforted.

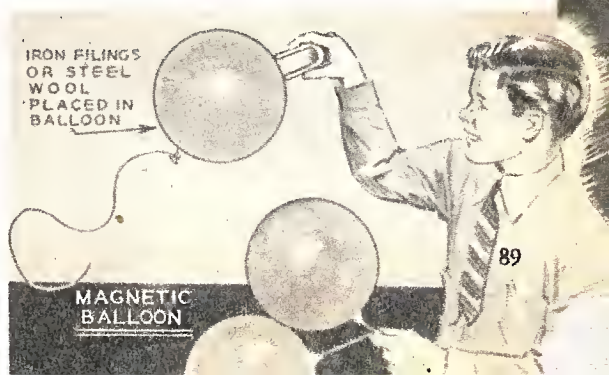
THE FEEDING CHICKEN—From a piece of stiff cardboard, cut the profile of a chicken, the size depending on the strength of the magnet to be used. To the side of the chicken that is away from the audience, attach a strong magnet by means of cord or thin wire. Place the magnet as close as possible to the mouth of the chicken without having it show. Using small ball bearings as feed, bend the chicken down close to the ground and notice how rapidly it "eats."


THREE SMALL STEEL BALLS WITHIN POLES OF LARGE MAGNET
SECOND MAGNET ABOUT ONE HALF SIZE OF OTHER MAGNET
THE THREE MUSKETEERS

THE THREE MUSKETEERS—Between the poles of a large magnet, place three ball bearings. Be sure that they are touching each other, and are as close to the center as possible. Then bring a magnet about half the size of the larger one between the poles of the latter, and towards the ball bearings. As the magnet approaches the three ball bearings, they will move backwards.

WATER COMPASS—Into a small vial or glass tube, place a small nail with the head toward the bottom of the vial. Cork it up and place it in a tumbler or pan of water. As the vial floats it is free to move in any direction. Then bring the magnet close to the vial but not touching it, and notice how it follows the magnet around the edge of the pan.

MAGNET BALLOON—Into a dark colored balloon, place a few pinches of iron filings or a small piece of steel wool. Then inflate the balloon and tie the end with a piece of cord or rubber-band. Place it on the table or floor and bring a magnet closeby. The balloon will rise rapidly off the table or floor to meet the magnet.



A Revolving Magazine Rack

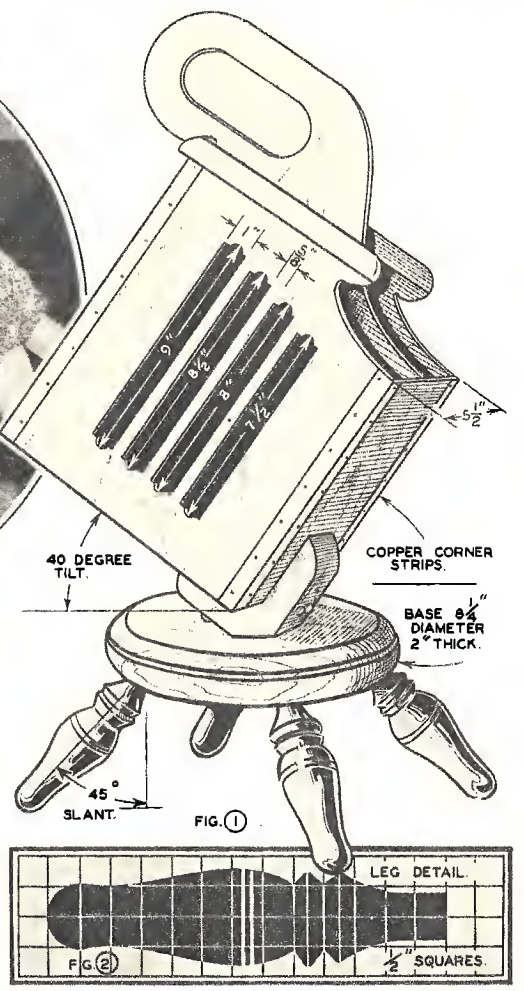


FIG. 1

FIG. 2

by O. E. Olson

HERE is a magazine rack that is as practical as it is novel. The box rotates freely on a sturdy pivot staff, making the magazines available from any angle. The pleasing Colonial design makes it a truly attractive piece.

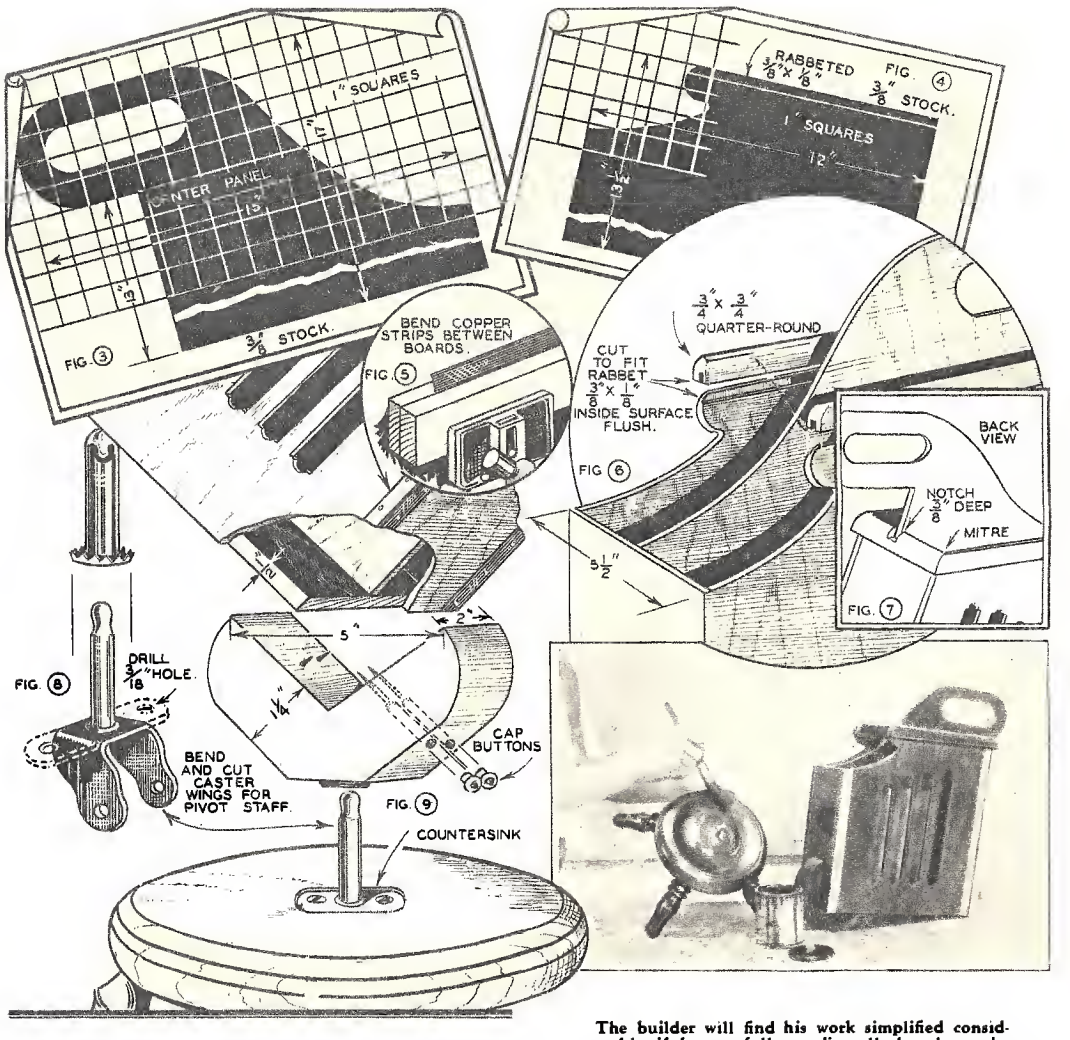
Furniture woods characteristically Colonial, such as maple, walnut, cherry or birch, are the best to use. Start by laying out the box sides on ⅜" stock according to the graphed drawing, Fig. 4. It is likely that material will have to be glued up to obtain the desired width. The vertical design openings are started by boring a ⅝" hole at the top and bottom of each space, then cutting with a scroll-saw a sabre blade. The top edge is rabbeted ⅜"x⅛", to fit the slot in the quarter-round trim.

Next cut the back and front pieces 4¾" in width, and rabbet same as the sides. The bottom board is cut from ½" stock. Assemble sides and bottom of box with wire brads. Then cut the quarter-round trim and rabbet as shown in Fig. 6. The back corners are mitered as shown in Fig. 7. The inside edge of trim should fit flush with inside of sides. Sand and glue pieces in place.

Layout and cut the center, or handle piece of glued stock, following the dimensions as shown in Fig. 3. Sand well with fine sandpaper, and fit in place by notching trim as shown in Fig. 7. The front and back edges are held with ¾" wire brads.

The angle block is cut as shown in Fig. 9, and is fastened to the box with hidden flathead screws. The screws are set in ⅜" holes which act as deep countersinks. Cover these holes with button caps as shown in the drawing. These caps may be purchased ready to use or may be turned on a lathe. As the lower cut of the angle block determines the angle at which the box will stand, it should be checked carefully. The cut made should hold the box at an angle of forty degrees from level, as shown in Fig. 1.

Next, turn the cricket stool top from 2" stock, 8¼" in diameter, the edge design of



The builder will find his work simplified considerably if he carefully studies all the above details, making patterns full size before starting construction. This piece of furniture will be never-ending source of convenience to the user.

which can be either plain or grooved. Sand on a lathe with fine sandpaper. Then turn the legs according to specifications of graphed layout, shown in Fig. 2. Two legs may be turned in a single piece on the lathe.

To insure a uniform slant of forty-five degrees of each leg from the top, it might be well to use a boring jig, made by boring a ¾" hole of the desired slant in a piece of 2" waste stock, and clamping this piece in position to the turned top, as a guide.

Before gluing the legs in position, make and fasten the pivot staff to the top. To make this staff, bend and trim the wings of an ordinary grip-neck caster, as shown in Fig. 8, and bore two $\frac{3}{16}$" holes in wings as shown. Slightly countersink the caster wings in cricket top and fasten with two 1" screws. Then bore a hole in the angle block to fit the clipsocket for caster staff. It is important that this hole be at a right-angle to the base of the angle block. A flat, ball-bearing type caster can be used successfully, but requires somewhat different assembly.

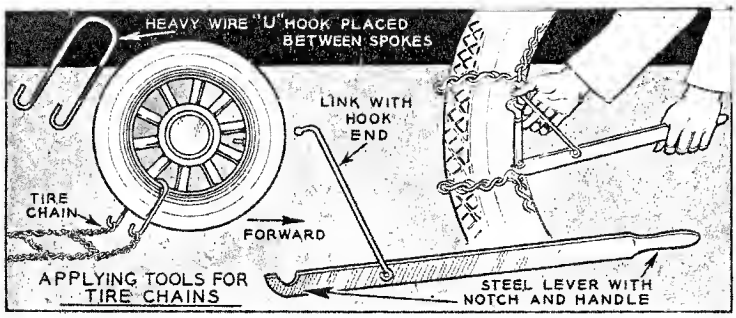
Finish before putting on the copper corner trims. Stain desired color, and apply a coat of white shellac. When this is dry, rub down with No. 00 steel wool, and follow with a coat of good furniture varnish. Let stand until thoroughly dry then rub again with steel wool. Apply a second coat of varnish, and when dry bring to a high lustre by rubbing with pumice and oil.

The copper corner strips add greatly to the appearance of the piece, and can be made by bending 1¼" strips between boards, as

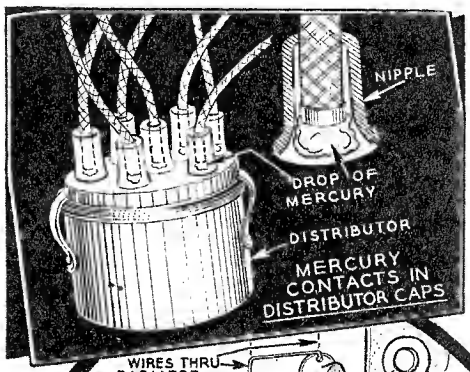
[*Continued on page* 140]

Timely auto tips that help to simplify cold-weather driving.

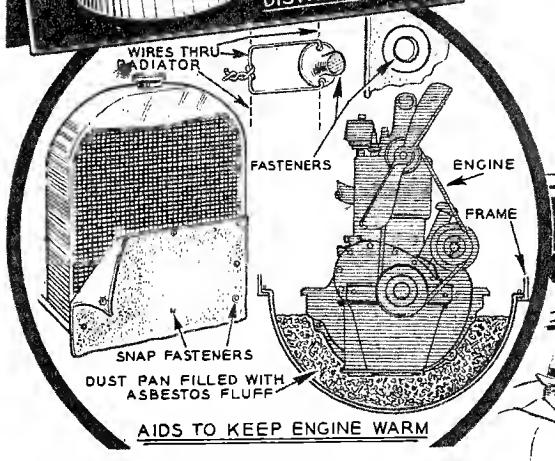
WINTER AIDS FOR MOTORISTS


HEAVY WIRE "U" HOOK PLACED BETWEEN SPOKES
LINK WITH HOOK END
TIRE CHAIN
FORWARD
APPLYING TOOLS FOR TIRE CHAINS
STEEL LEVER WITH NOTCH AND HANDLE

These simple tools permit the motorist to install tire chains in a fraction of the usual time. A hook formed from heavy iron wire is slipped bewteen the wheel spokes, the chains attached to the ends and the car driven forward. The hook is then removed aod the chains locked with the aid of the simple lever shown.

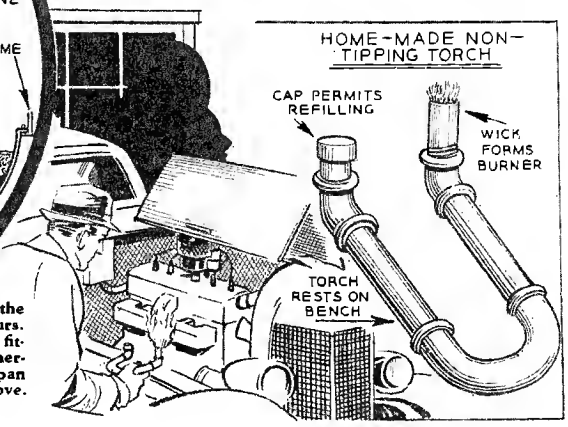


Left—To insure a hot spark it is vitally important that the ignitioo circuit be in perfect working order. After a car has been in use for some length of time the distributor cable plugs become faulty, resulting io the loss of spark. To overcome this, pour a few drops of mercury in each nipple and replace the high-tension cables.

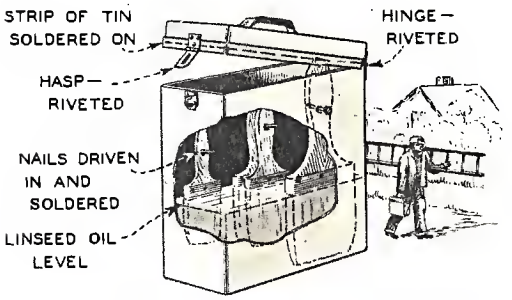


Every motorist is troubled with the problem of keeping the motor warm when parking the car outdoors for several hours. Excellent insulatioo against cold can be provided by fitting the radiator with a cover made from felt-backed leatherette and filling the space between the engine and dust pan with asbestos steam pipe packing in manner outlined above.

The blow torch illustrated below will find many practical uses around the garage and workshop. It is especially useful for heating the car manifold so as to permit quick starting in cold weather. The torch coosists of scrap pipe and fittings connected as shown. Cotton wicking forms the burner. Alcohol or keroseoe may be used for fueling torch.



PRACTICAL WORKSHOP KINKS

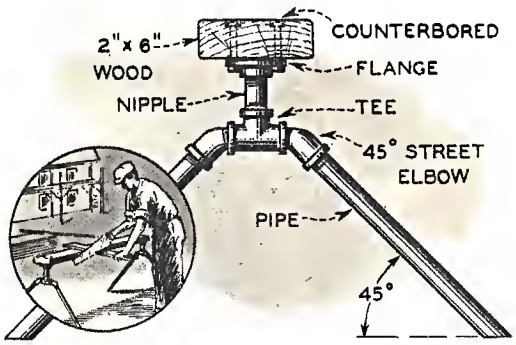


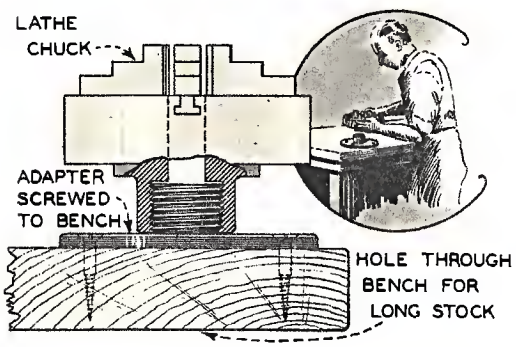
Handy Paint Brush Container

A ONE-GALLON varnish can makes a useful container for spare paint brushes. Cut off the top of the can and fit it with a hinge at one end. Solder a strip of tin around the end of the lid so that it overlaps on the can. Punch holes in the sides of the can at varying heights and solder nails in them to serve as brush hooks.—R. A. Kelly.

Shop Horses Made Of Pipe

A PAIR of heavy-duty shop horses that will find practical application about the shop can be formed from lengths of one-inch pipe and several fittings. Assemble the legs as shown in the accompanying illustration, sawing off the ends of the pipe at an angle of 45° The counterboard is a length of 2 by 6 inch stock cut to the desired length and bolted to the flanges. The use of elbow fittings eliminates pipe bending.—W. C. Wilhite.





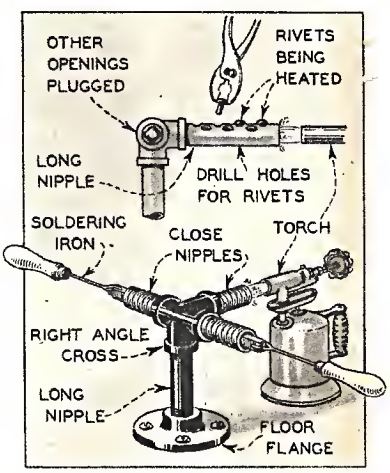
Chuck Forms Bench Vise

BY MEANS of a lathe chuck adapter bolted to one corner of the workbench, the regular lathe chuck can be employed as a vise for holding small metal turnings that require filing, sawing or threading. A hole drilled through the bench, directly underneath the adapter, permits working with long stock.—Homer West.

Blow Torch Soldering Iron Stand

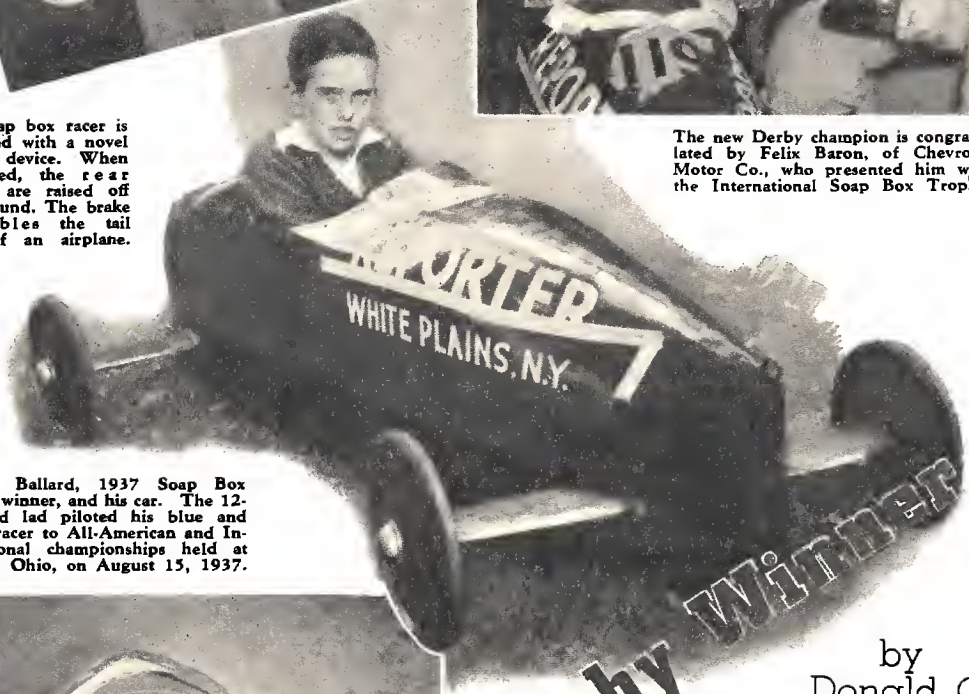
A SOLDERING iron stand that derives its construction from pipe fittings, and heat from a blow torch, will insure the metal worker of a hot iron at all times. The stand is formed from a length of 1-inch pipe, floor flange, right angle cross and three pipe nipples. The supporting pipe is stuffed with asbestos wool so that heat does not penetrate to the workbench and the various fittings assembled in the manner shown.

A blow torch flame directed into the center nipple will distribute heat to the remaining nipples, which serve as holders for the soldering irons. The stand may be also used as a rivet heater by drilling holes for their accommodation in one of the nipples.—M. A. Hall.



The soap box racer is equipped with a novel braking device. When depressed, the rear wheels are raised off the ground. The brake resembles the tail skid of an airplane.

The new Derby champion is congratulated by Felix Baron, of Chevrolet Motor Co., who presented him with the International Soap Box Trophy.



Robert Ballard, 1937 Soap Box Derby winner, and his car. The 12-year-old lad piloted his blue and white racer to All-American and International championships held at Akron, Ohio, on August 15, 1937.

Looking into the cockpit. The brake pedal is located beneath the steering wheel. Pedal and brake are connected by a steel cable. Sides of cockpit are padded. Celluloid windshield rises above cowl.

Soap Box Derby Winner

by Donald G. Cooley

WHEN better soap box racers are built, young workshop fans like Robert Ballard will build them.

Robert is the twelve-year-old youngster of White Plains, New York, who holds the title of world's champion soap box racing pilot —a soap box racer, of course, being a home-built, boy-size vehicle which uses gravity or human pushing power for a motor. Bobby won both the national and international championships a few weeks ago when his racer proved itself the fastest thing on wheels at the fourth running of the All-American Soap Box Derby at Akron, Ohio.

His victory entitles him to a four-year

Receives College Scholarship

This aerial view of Derby Downs, near Akron, Ohio, shows the huge inclined track on which the soap box races were held. More than 100,000 spectators attended the meet, an annual junior sports event.

scholarship in any state college or university he may choose. He also won a silver trophy and a diamond-set gold medal. The mantel above the fireplace in his home is overflowing with trophies testifying to his skill as a desginer of soap box racers.

[*Continued on page* 132]

This view of Bob Ballard's soap box racer provides a clear conception of the streamlined design of the body, the faired axles and the road-hugging qualities imparted by the underslung design and wide-spaced wheels. Left—This top view shows the cigar-shaped body with tapering nose and tail. The driver's seat is just wide enough to admit pilot.

FELT GLUED TO INSIDE OF BOX
OUTER AND INNER TRIM AND HINGES
CROSS SECTION
HOLES FOR MEN
INLAID SQUARES OF MAPLE AND WALNUT GLUED TO TOP BOARD
SHOWING INSIDE OF BOARD WITH CHESSMEN

A NOVELTY VEST POCKET CHESS BOARD

Designed by Seth and Boyd Pulley of Logan, Utah, this tiny chess board, measuring but 3¼ by 7 inches when closed, conveniently fits into the vestpocket. Playing pieces are lathe-turned so as to fit into holes drilled in the maple and walnut inlaid playing board.

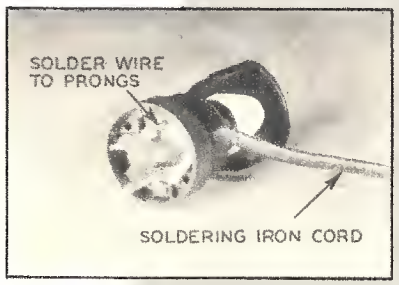
THE veteran chess fan will derive much pleasure from this lilliputian version of the ancient but popular game of mental skill. Not only is this little board unique in size, but novel in construction as well, for its playing pieces are so made that they cannot accidentally shift position while in play. The board consists of a hinged maple box with the checkers inlaid in walnut on the bottom and top.

Little explanation regarding the making of the box is necessary. Each half measures 3¼ by ½ by 7 inches. The sides are made of ½ by ¾-inch lengths of maple plywood or solid stock about ¼-inch thick. Blocks for the checker design are cut from walnut and maple veneer and attached with casein glue.

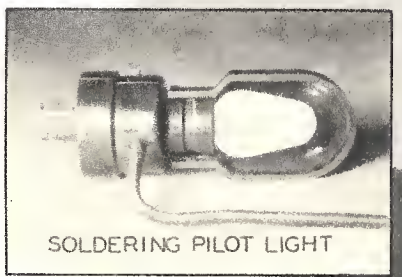
After the glue has set, carefully drill ⅛-inch holes in the exact center of each square for inserting the playing pieces. Drill the holes so that they pass through the blocks, but not through the maple stock underneath

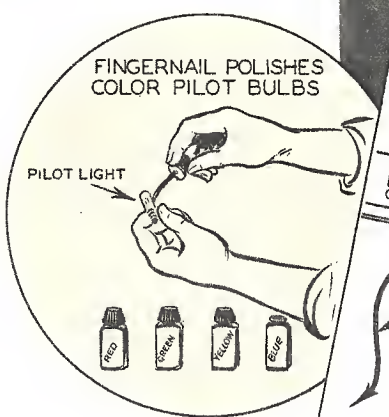
[*Continued on page* 128]

RADIO SPARKS

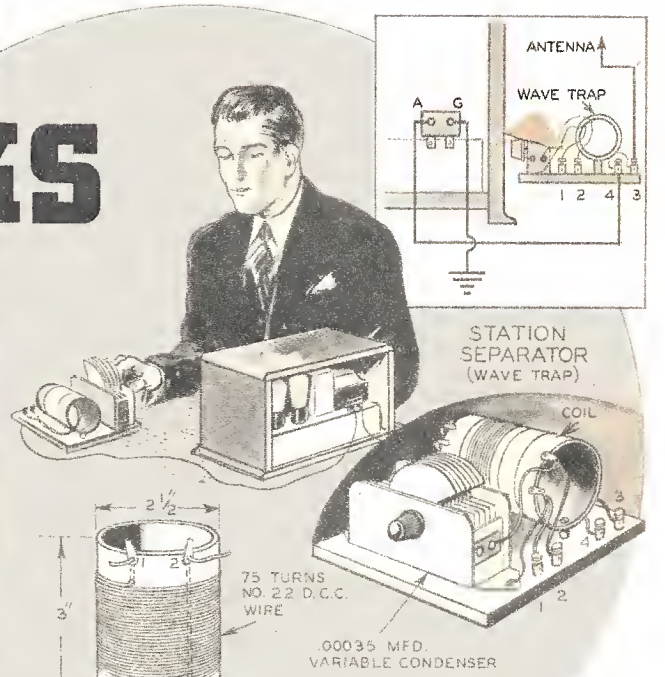


By replacing the regular soldering iron plug with a night lamp, as shown, unnecessary waste of current, when iron is not in use, will be avoided.

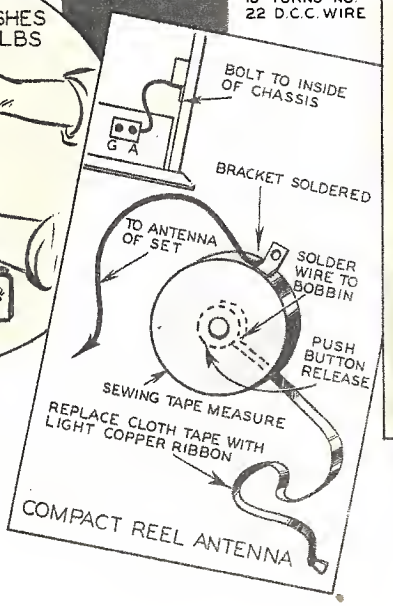




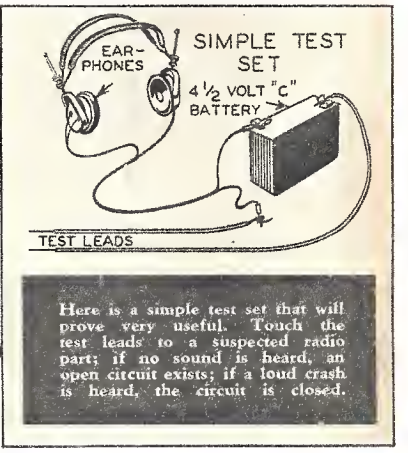
Ordinary fingernail polishes may be used for tinting colored pilot bulbs used to identify wave bands in all-wave radio receivers.



On early receivers where it is difficult to separate local stations, a wave trap will often overcome interference. It consists of a .00035 mfd. variable condenser and home-made coil mounted on a wooden base. Wind the first coil with 75 turns of No. 22 d.c.c. wire on a 2½ by 3-inch coil form. Connect the ends of this coil to the condenser and two terminals, labeling them 1 and 2. Over the end of the 75-turn coil wrap two layers of adhesive tape and on this, another winding of 10 turns. Connect the ends of this winding to terminals 3 and 4. To use the station separator, connect terminal 3 to antenna and 4 to antenna post of receiver. Adjust condenser until interference is overcome. If this does not work, connect antenna to terminal 2 and lead from antenna post on set to terminal 1.

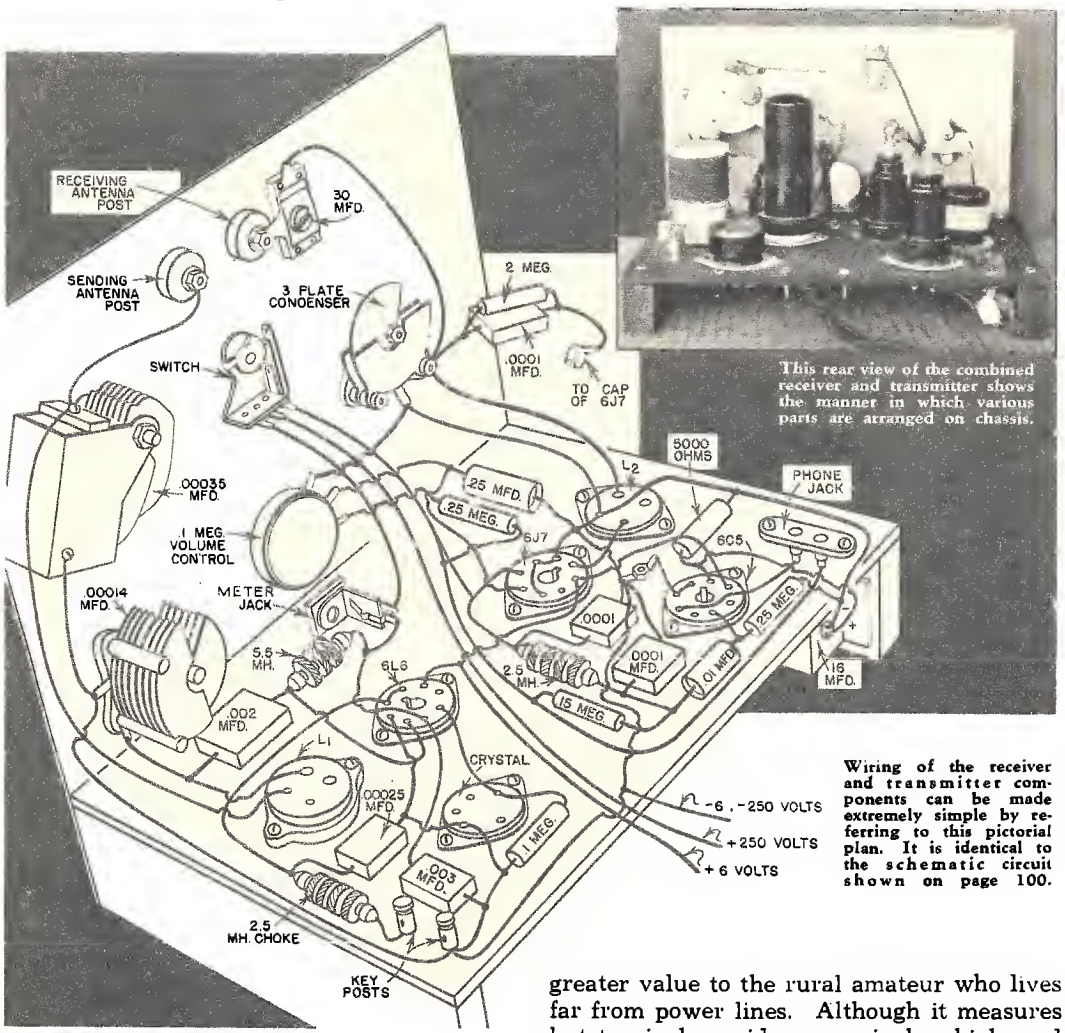


Left—This compact reel-type antenna is especially useful for travelers. It is made by replacing the cloth tape of a sewing measure with a copper ribbon. The tape reel is connected to set as shown.


SIMPLE TEST SET
EAR-PHONES
4½ VOLT "C" BATTERY
TEST LEADS
Here is a simple test set that will prove very useful. Touch the test leads to a suspected radio part; if no sound is heard, an open circuit exists; if a loud crash is heard, the circuit is closed.

Complete Amateur Station

by Stanley Johnson



This rear view of the combined receiver and transmitter shows the manner in which various parts are arranged on chassis.

Wiring of the receiver and transmitter components can be made extremely simple by referring to this pictorial plan. It is identical to the schematic circuit shown on page 100.

THE ability of simple short-wave sets to provide communication when all other means are wiped out has time and again proved of priceless value to isolated communities. Yet too often, emergency equipment independent of power lines is not built up until a sleet storm has left communication wires an icy tangle or flood water is beginning to trickle across the living room floor.

This receiving and transmitting unit—actually a complete amateur station—may be operated entirely from but a single storage battery, making it an ideal emergency-portable unit for any amateur and of even greater value to the rural amateur who lives far from power lines. Although it measures but ten inches wide, seven inches high, and seven inches deep, it is capable of surprising output at low plate voltage. The unit shown in the photographs was used in the national amateur "Field Day Contest" last year, and during sixteen hours of operation allowed contact with 22 stations in a dozen states, including widely separated California, New York, Minnesota and Texas. Input to the transmitter was 10.5 watts, obtained from a small genemotor.

The unit uses three metal tubes, a 6L6, a 6J7, and a 6C5. The 6L6 serves as a crystal oscillator in a new transmitting circuit which allows clean keying on the fundamental frequency, good output when doubling, and

Operates From Storage Battery

The unusual compactness of the combination transmitter and receiver permits it to be set up for emergency operation indoors or out.

simplified antenna matching — all with but two tuning condensers and a single coil. The 6J7 and the 6C5 provide for reception in an improved electron coupled detector—resistance coupled audio receiving circuit.

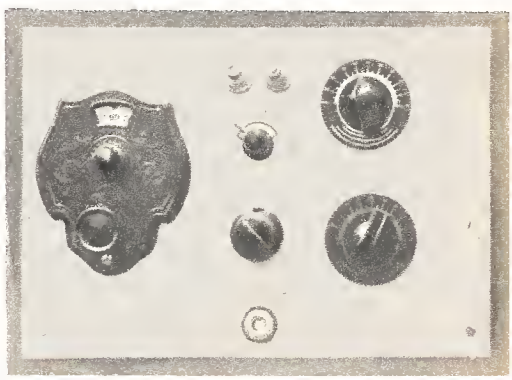
All of the tubes used are of the six-volt variety which may be lighted by a storage battery. The same battery can drive a 6-250 volt 50 milliampere genemotor to supply the plate voltage. Five or six heavy duty "B" batteries may be substituted for the genemotor, but vibrator power supplies of the type used in automobile radios are not recommended because of poor regulation and the difficulty of filtering them enough to allow their use with short-wave receivers.

The use of a black crackle finished pressed wood material for the base panel makes the transmitter-receiver easy to build. Holes may be drilled with ordinary wood tools. Small wood cleats support the base panel in order to allow space underneath for the wiring and small parts. The front panel is a 7 x 10-inch sheet of a zinc alloy material similar in appearance to aluminum but cheaper and easier to work. All tuning controls—the "send-listen" switch which shifts the "B" voltage from the receiver to transmitter, the jack for the plate current milliammeter and the two antenna insulators—are all on the panel.

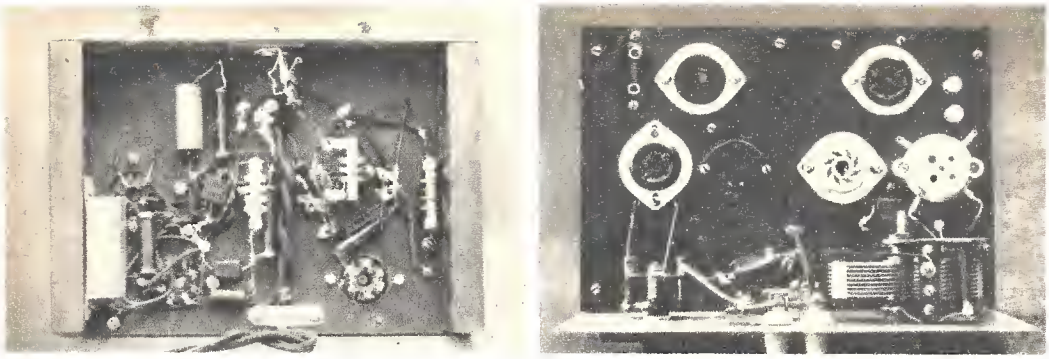
The receiver portion of the unit requires the most wiring so it is best to wire it first. All radio-frequency "grounds" are made to a group of soldering lugs between the two receiver tube sockets. Short leads and well-soldered connections are important. Looking at the set from the bottom, receiver wiring is separated from transmitter wiring by the four wire power cable.

The detector circuit of the receiver features an improved version of the electron coupled oscillator. Notice that the cathode "tickler" coil is wound in the *opposite* direction from the "grid" coil and unlike the older circuit, only the grid coil is tuned. A very small variable condenser, made by removing two plates from a five-plate midget variable, is used for tuning in order to spread the amateur bands over a good portion of the dial. The builder must be careful in winding coils, however, or the narrow bands will be missed entirely. Some adjustment of the antenna coupling condenser may be necessary in order that the amateur bands fall in the center of the dial.

Once the receiver is completed and working properly, you are ready to begin on the transmitter. The circuit is one of the several new regenerative crystal circuits. Regeneration, obtained from the radio frequency choke and condenser in the cathode circuit, increases the output and allows keying of the transmitter at the crystal frequency under considerable antenna load. This particular method of securing regeneration is generally



When the set is not in operation, be sure the changeover switch is either in the off position or on "transmitter." When the switch is in "receiver" position, the potentiometer and dropping resistor are connected across the "B" battery.



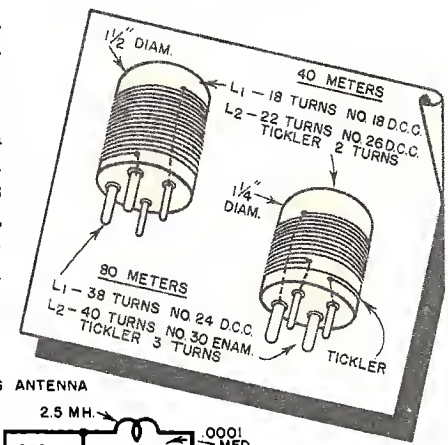
The above photos show both top and bottom of the transmitter and receiver chassis. The chassis is constructed of Masonite for easy drilling. The panel is of aluminum or zinc alloy.

credited to Frank C. Jones, veteran short-wave experimenter. Thanks to the high mutual conductance of the 6L6, excellent output is obtained at twice the crystal frequency simply by tuning to the second harmonic.

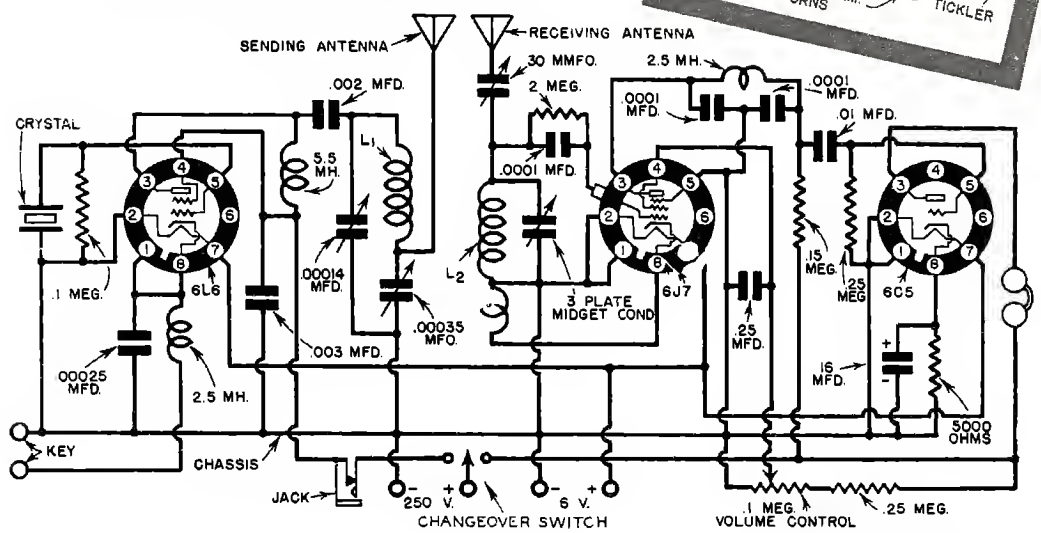
Since the currents are heavier than in the receiver, number 14 enameled wire is used for the radio-frequency leads. As before, "grounds" are made to a single point, this time to the juncture of the two by-pass condensers. The jack for the plate current milliammeter must be insulated from the metal panel. Transmitter coils are wound on molded coil forms and tube and coil sockets are of similar high insulating material.

The crystal for the transmitter should be a high power "A-T" or "LD-2" cut. A good 80-meter crystal with a frequency between 3,500 and 3,650 kilocycles will allow operation on both 80 meters and 40 meters, although slightly more output is obtained with separate crystals for each band. The forty-meter band gives good results on low power in the daytime, 80 meters being preferred for operation at night. An easily erected antenna for both bands is the "end fed Hertz," a single wire 133 feet long. The antenna condenser is adjusted for the desired antenna load and then resonance is restored by rotating the plate condenser. A six-volt dial light bulb,

[*Continued on page* 124]



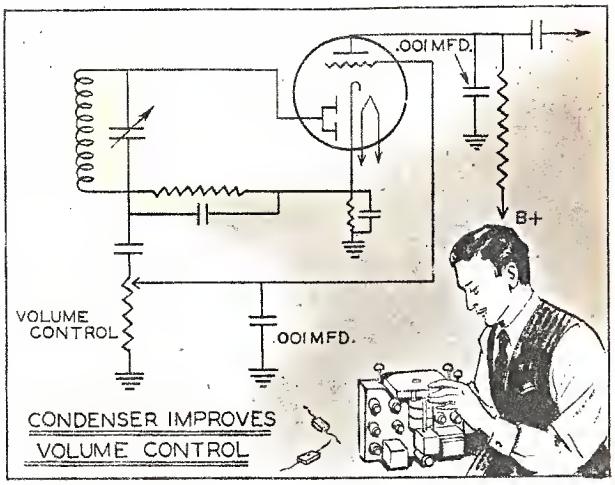
This schematic wiring plan corresponds with the pictorial plan on page 98. Coil data are at right.



Condensers Improve Efficiency Of Volume Control

IN MANY receivers employing a diode-triode type of second detector, the volume is not zero when the volume control is turned all the way down. This condition would be satisfactory were it not for the fact that the signal heard is usually badly distorted. The trouble is probably due to coupling between the diode plates and the plate of the tube, which are in the same envelope. Because of this coupling, r. f. energy gets into the plate of the tube and rectification takes place in the plate circuit—bad rectification at that. The remedy is to connect a .001 mfd. fixed condenser between plate of this tube and ground.

A similar, but more peculiar volume control action takes place in other cases. The volume is zero when the volume control is set at zero; but as it is increased slowly, the volume rises, falls sharply, and then rises again. In this instance, the trouble is due to coupling to the grid of the detector tube from the diode plates. The r. f. coupled to the plates is rectified by the grid; the audio coupled to the grid through the usual channel is out of phase with this spurious signal. The two are equal and opposite at a certain setting of the volume control. The remedy is to connect a .001 mfd. fixed condenser between grid and ground.



On some receivers the volume control, though fully retarded, fails to completely silence reception. The insertion of fixed condensers in the circuit as indicated above will eliminate this trouble in most cases.

Reducing R. F. Oscillation

RADIO-FREQUENCY oscillations are often traced to the audio-frequency end of the receiver, especially when high-sensitivity beam output tubes are used. In the event that the cause of a persistent oscillation proves elusive, try these simple remedies.

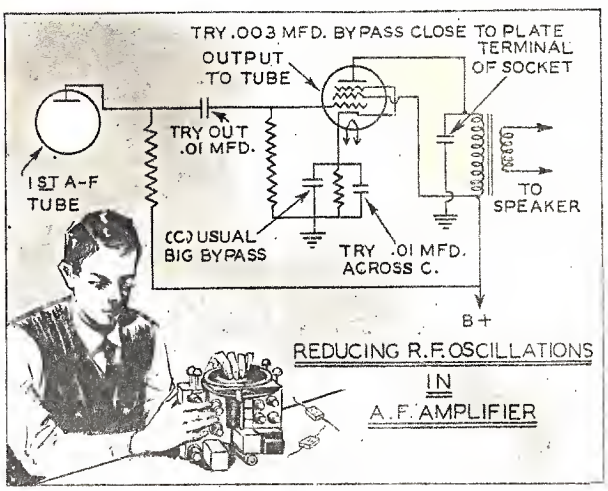
If the output tube is of the glass type, shield it and ground the shield solidly to the chassis.

Connect a small mica condenser (.01 mfd.) across the self-bias resistor. This condenser is in addition to the usual large by-pass (c.) ordinarily employed.

Connect a small mica condenser from the plate terminal of the output tube to chassis. This condenser should have a value of about .003 mfd. and be placed as close to the plate terminal of the socket as possible. An inch is a long distance here.

Try replacing the familiar coupling condenser with one of mica construction. Paper condensers sometimes leak (electrically), which may decrease the bias on the output tube to the point where ordinary preventive measures fail.

These ideas are illustrated schematically in the accompanying diagram so as to simplify repairs.

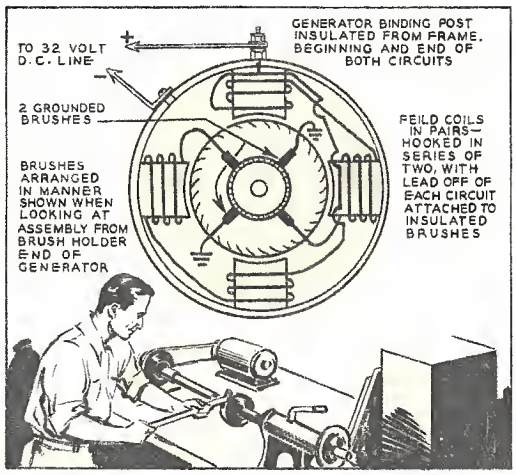

TRY .003 MFD. BYPASS CLOSE TO PLATE TERMINAL OF SOCKET
OUTPUT TO TUBE
TRY OUT .01 MFD.
1ST A-F TUBE
TO SPEAKER
(C) USUAL BIG BYPASS
TRY .01 MFD. ACROSS C.
B+
REDUCING R.F. OSCILLATIONS IN A.F. AMPLIFIER

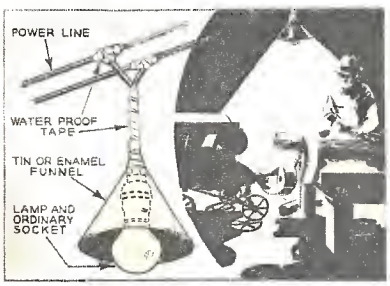
R. f. oscillation in the a. f. amplifier of a receiver may be reduced by the addition of fixed mica condensers in the circuit as shown. Make lead of .003 mfd. condenser to output plate as short as possible.

ELECTRICAL KINKS FOR THE WORKSHOP

Shop Motor From T Generator

A MODEL T Ford generator can be converted into a practical 32-volt d.c. motor for use on rural lighting systems. Remove the end of the generator housing and replace original brush holder with a four-brush holder taken from a model T starter motor. Secure the new brush holder to generator brush rack ring by threading it to take four small machine screws, first sawing ring in half with hack saw so that it can be inserted. Substitute carbon brushes with the copper type as used in the starter motor, then connect field coils in manner shown in diagram. H. E. Gruntmeir.


TO 32 VOLT D.C. LINE
GENERATOR BINDING POST INSULATED FROM FRAME, BEGINNING AND END OF BOTH CIRCUITS
2 GROUNDED BRUSHES
BRUSHES ARRANGED IN MANNER SHOWN WHEN LOOKING AT ASSEMBLY FROM BRUSH HOLDER END OF GENERATOR
FEILD COILS IN PAIRS—HOOKED IN SERIES OF TWO, WITH LEAD OFF OF EACH CIRCUIT ATTACHED TO INSULATED BRUSHES

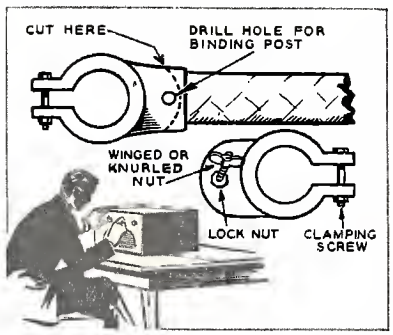


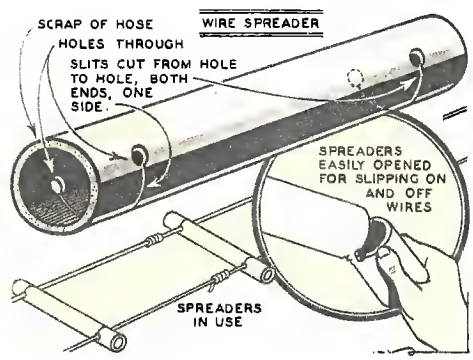
A Weatherproof Workshop Light

TO WATERPROOF an electric drop-light located in some damp part of the workshop will not only add life to the fixture and cord, but provide a safeguard against fire. Drop the leads from the power line through an inverted tin or enameled funnel and apply tape over both funnel spout and wires. The funnel not only prevents water from entering the lamp socket, but serves as an efficient shade and reflector.—A. C. Klust.

Auto Cable Used On Shop Battery

BATTERY post clamps, such as can be salvaged from old automobile battery cables, are of practical value to the electrical experimenter. Saw off the cable as close to the clamp as possible, then drill a hole through it for inserting a machine bolt. Fitted with a knurled or winged nut, the bolt serves as an excellent terminal for connecting leads from motors, welders and radios.—E. Z.




SCRAP OF HOSE
WIRE SPREADER
HOLES THROUGH
SLITS CUT FROM HOLE TO HOLE, BOTH ENDS, ONE SIDE.
SPREADERS EASILY OPENED FOR SLIPPING ON AND OFF WIRES
SPREADERS IN USE

Hose Forms Wire Spreaders

SHORT lengths of rubber garden hose provide inexpensive spreaders for temporary electric lines such as strung up for outdoor celebrations and building operations. Cut the hose into 6-inch lengths and drill holes through the rubber about 1 inch from each end. With a sharp knife slot the hose so that the light line may be inserted in the spreader by bending it in manner shown.—A. W.

MODERN PHOTOGRAPHY

A Special Section of MODERN MECHANIX—Pages 103 to 116

FOURTH AWARD—Photographs such as this will substantiate the tallest of fisherman's stories. The large mouthed bass were posed in a toy boat. E. H. Cook of Ft. Wayne, Ind., took the photo with a 4x5 plate camera using a ¼-sec. exposure and f:8 lens stop. His picture merited a $5 fourth award.

SECOND AWARD—Table-top photography lends itself well to amusing subject matter. This chine dog and cat, posing with a bantam camera, resulted in a photo of distinct novelty. Taken with a 4x5 Premo camera stopped to f:16 and 2 sec. exposure, it earns second award of $10 for L. J. Jonas, Reno, Nev.

FIRST AWARD—Recipient of the $15 award is Dr. W. D. Whiteside of Timeon, Texas. His unusual composite picture consisted of two individual shots, taken with a Recomer 18, pasted together and then copied. The children were posed on a teeter board so as to obtain correct position on composite.

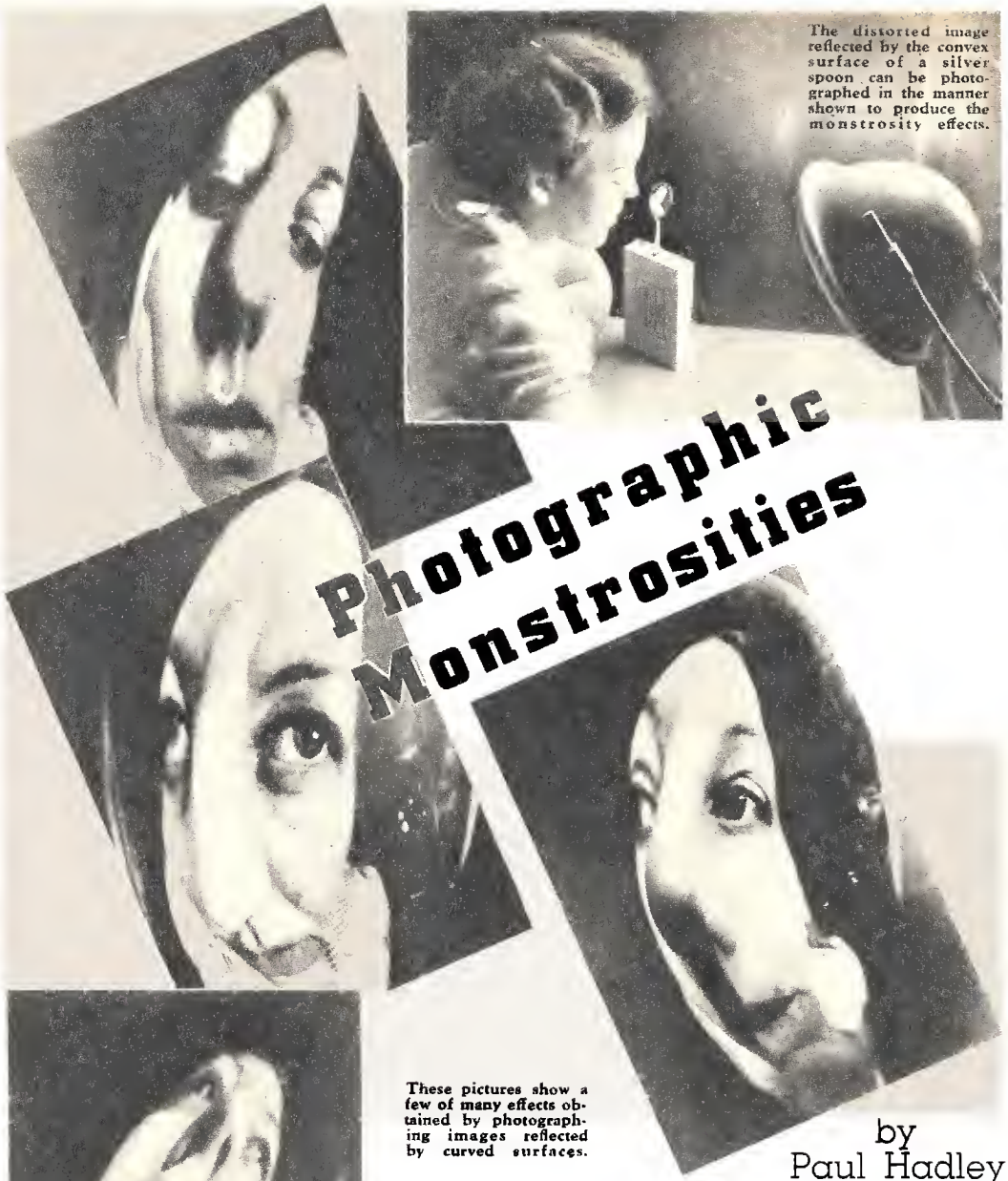
FIFTH AWARD—This picture of a skyscraper cactus plant isn't an oddity of science, but a photo illusion. The camera, a 79c box type, was placed on ground near the plant. The man stood 60 ft. in the rear. The picture earned $5 for A. J. Mauo, Seattle, Wash.

MONEY FOR YOUR PICTURES!

Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay $15 for the best picture received from readers, $10 for the second choice, and $5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big, fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed, lens opening and shutter speed, and lighting conditions. Also your name and address. Wrap all prints carefully and include postage if you want them returned. Address all contributions to Photography Editor, MODERN MECHANIX, 1501 Broadway, New York, N. Y.

THIRD AWARD—Possessing a third dimension effect, this picture merited a $5 award for Bill Staff, Aberdeen, Wash. It was produced by making a positive film of the original negative, placing both films together, shifting one slightly to the left, then printing.

WINNERS OF THIS MONTH'S PHOTO AWARDS OFFERED BY MODERN MECHANIX



The distorted image reflected by the convex surface of a silver spoon can be photographed in the manner shown to produce the monstrosity effects.

Photographic Monstrosities

These pictures show a few of many effects obtained by photographing images reflected by curved surfaces.

by Paul Hadley

FREAKISH photographs, in which the image of a person's head or body appears hideously distorted, are frequently seen in picture exhibitions and in advertising. These always attract the eye, but the amateur picture-maker generally considers the making of these photographic "monstrosities" as beyond his ability.

However, a glance at the accompanying illustrations will show that one need not be an expert photographer or have special equipment in order to get really astonishing results. An ordinary plate camera, with ground glass back and a long bellows to permit focusing within six

[*Continued on page* 124]

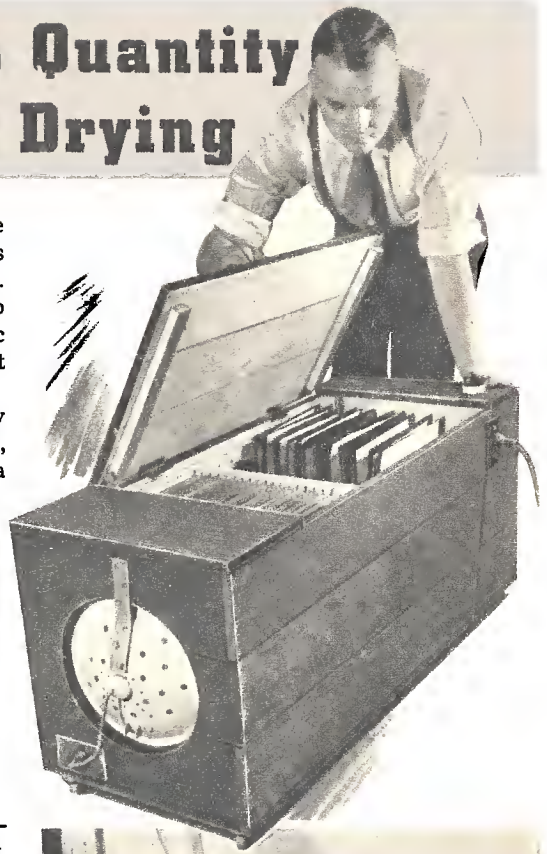
Cabinet Speeds Quantity Film and Print Drying

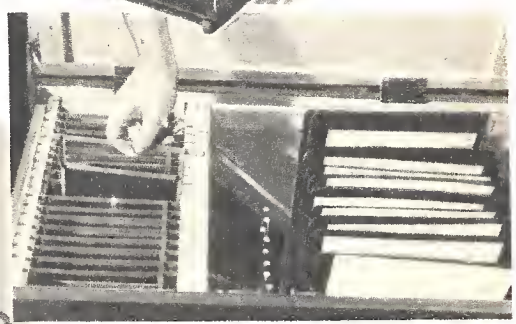
ONE of the chief annoyances of the average photographer is slow drying of films and prints when he is in a hurry for them. Although many large studios and news photo concerns are equipped with large automatic dryers, the average photographer cannot afford such a luxury.

The dryer described here was designed by Robert Raines, a New York photographer, and can be constructed at a cost of only a few dollars. Where a smaller dryer is desired, dimensions can be altered accordingly.

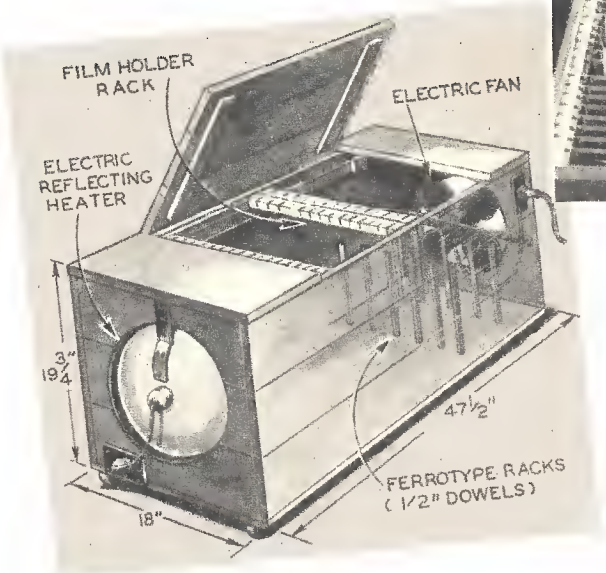
The drying cabinet, constructed of 1-inch pine or ½-inch plywood stock, measures 47½ inches long, 19¾ inches high and 18 inches wide. A reflecting type electric heater is mounted in one end of the cabinet with angle brackets. In the opposite end, an electric fan is mounted over a circular opening with the blades blowing the air outward. The fan, mounted in this manner, acts as an exhaust and distributes the heat evenly through the cabinet.

The inside construction of the box is simple. Four rows of dowels are inserted in holes drilled in the bottom of the cabinet to act as ferrotype racks. Four strips of ¾-inch stock, mounted across the top of the opposite end of the cabinet, serve as racks for the film holders, accommodating as many as fifty-four 4 by 5-inch films. On damp days, the cabinet will handle a complete drying operation in 15 minutes if the heater and the fan are operated at full capacity. The finished dryer is mounted on casters.

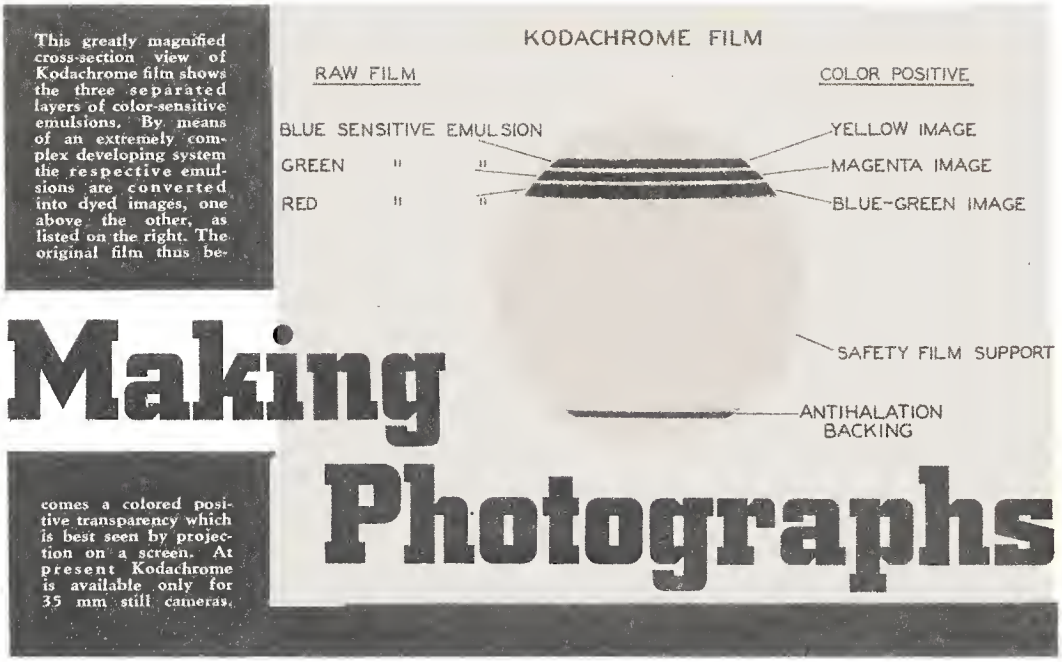




The inside of the cabinet is arranged to take both cut film holders and ferrotype plates. It accomplishes both drying operations at one time.



This phantom detail of the cabinet film and print dryer shows the placement of the electric heater and electric fan. Dimensions may be altered to suit individual needs.



This greatly magnified cross-section view of Kodachrome film shows the three separated layers of color-sensitive emulsions. By means of an extremely complex developing system the respective emulsions are converted into dyed images, one above the other, as listed on the right. The original film thus becomes a colored positive transparency which is best seen by projection on a screen. At present Kodachrome is available only for 35 mm still cameras.

Making Photographs

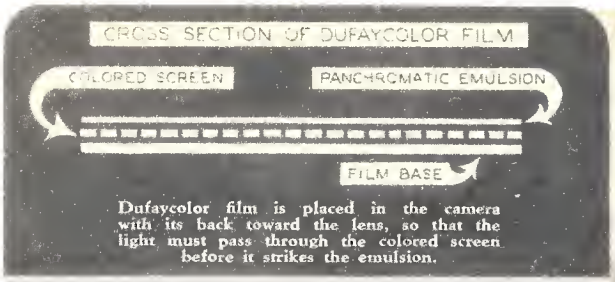
ALTHOUGH color photography for the amateur has been possible for many years, it is only recently that advantage has been taken of the several processes available. Advertisers have been conscious of the attention-getting value of color for some time; magazine editors have lately begun to use full-color photographs as cover illustrations and have been paying enormous sums of money ($500 to $1,000) for good "shots." Perhaps this increasing use of color photography in the graphic arts is what has focused the attention of the amateur on the fact that he, too, may take pictures in color.

The amateur may make two kinds of colored photographs: transparencies and prints on paper. A transparency is a film or plate which is exposed in a camera and then processed to give the colors of the original subject. It is like a lantern slide in that it is a positive and it is transparent. It must be viewed by holding it up to a source of light or projected upon a screen in a lantern. It is like a motion picture positive except that it is in color and does not show motion. When one uses Kodachrome or Dufaycolor or one of the several color plates, he has, after processing, the original film or plate on which the exposure was made.

While it is perfectly easy to make good transparencies, it is still very difficult to make prints. Many amateurs are doing it, however. First it is necessary to make three exposures of the object on three films through three different filters. These are called separation negatives. Positives are made from each negative. These positives may be on other film or on special paper, and each must then be dyed, toned, or pigmented. The dyes or pigments used must be exactly related to the colors of the filters through which the negatives were made. The positives must be superimposed on one another in exact register. This means that the camera must not move during the negative-making process. For correct color balance in the final print, it is imperative that the three negatives be correctly exposed and developed. One cannot shoot with the abandon possible in making black and white prints.

Transparencies can be made almost as easily as shooting off black and white film, and they are marvelously beautiful to look at. They are so beautiful that many amateurs have foresworn black and white photography completely, have bought themselves a good projector and, instead of passing black and white prints among their friends to look at, entertain them with natural size images of their vacation spots, their babies, their pets or their hobbies, thrown on a screen.

Still photographers are therefore following the trend of movie makers. So beautiful are the color movies, and because of color so full of apparent depth—a sort of third dimen-



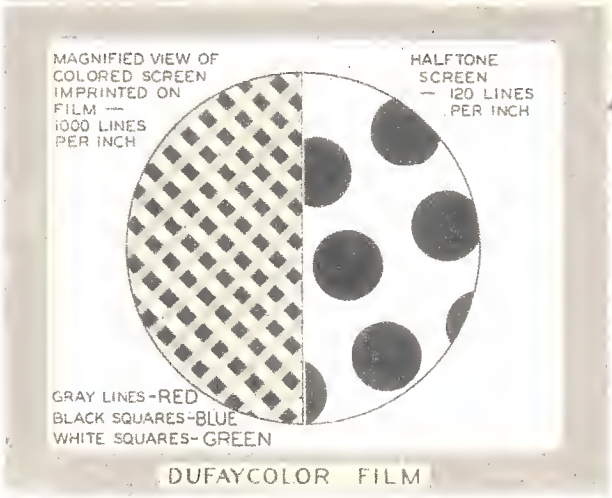
Dufaycolor film is placed in the camera with its back toward the lens, so that the light must pass through the colored screen before it strikes the emulsion.

A small, simple projector provides the best means of showing color pictures. The images can be thrown up to large size on any white surface, and are spectecularly beautiful.

Easy to "shoot", color films open new opportunities for camera fans.

In COLOR

by Keith Henney


MAGNIFIED VIEW OF COLORED SCREEN IMPRINTED ON FILM — 1000 LINES PER INCH
HALFTONE SCREEN — 120 LINES PER INCH
GRAY LINES-RED
BLACK SQUARES-BLUE
WHITE SQUARES-GREEN
DUFAYCOLOR FILM

The screen pattern of Dufaycolor film consists of a patchwork of red, blue and green lines, so fine that there are 1,000 to the inch. They are imprinted on the film base by precision machines, and then covered over by a panchromatic emulsion, on which the imege is actually recorded. A common 120-line halftone printing screen is shown for size comparison.

sion—that those who can afford it take nothing but color. Sales of color film have gone up over two thousand per cent in the last year!

There are several forms of color film available for the amateur. Dufaycolor has been available for several years both in cut film and in roll film for practically all cameras. Agfacolor plates have been on the market for years. Recently Eastman made available to owners of 35-mm still cameras its beautiful Kodachrome, which has done more to convert movie makers to color than any other factor.

All one has to do is load his camera, or his plate holders, with these materials and shoot it off—taking care that he observes the fact that these sensitive materials must be carefully exposed. They do not have the latitude of black and white; they must be correctly exposed if true color values are desired. One cannot go barging about shooting right and left with color! The amateur must know what he is doing.

Dufaycolor is an additive process in which true color values are secured by the light passing through an enormous number of minute colored filters embedded in the support on which the sensitive silver emulsion is placed. Dufaycolor can be processed at home, is good fun and not difficult. Anyone who develops his own black and white films can handle Dufaycolor, provided he is willing and capable of working in absolute darkness during the early part of the developing process. In this, Dufaycolor does not differ from the use of any highly sensitive panchromatic film. It must be developed by time and temperature and not by inspection—unless the materials are desensitized before development. Dufaycolor, however, will

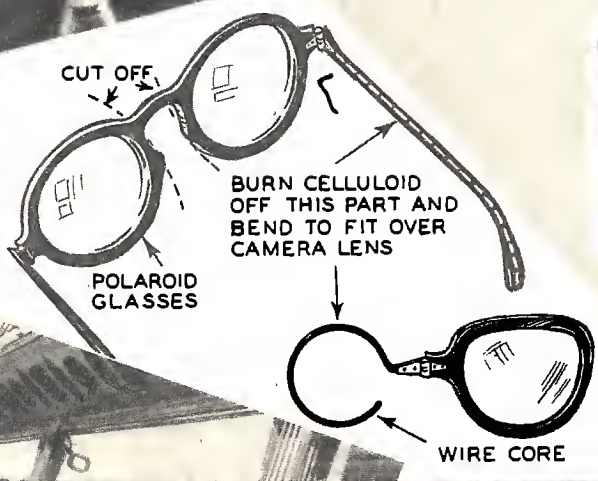
[*Continued on page* 133]

Polaroid Glasses Make

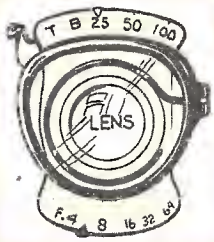
POLAROID glasses, which cost only $3.75 as compared with regular Polaroid photographic screens costing from $12.00 to $27.00, provide an inexpensive means for experimenting with polarized-light photography.

These glasses, now generally available at optical stores, are designed to eliminate or reduce objectionable and blinding sun or headlight glare. With them, it is possible to see through and beyond a transparent glass surface or body of clear water without the glare or reflections ordinarily seen on the same surfaces. In the case of opaque reflective surfaces, objects placed on them will not show reflections when viewed through the Polaroid glasses.

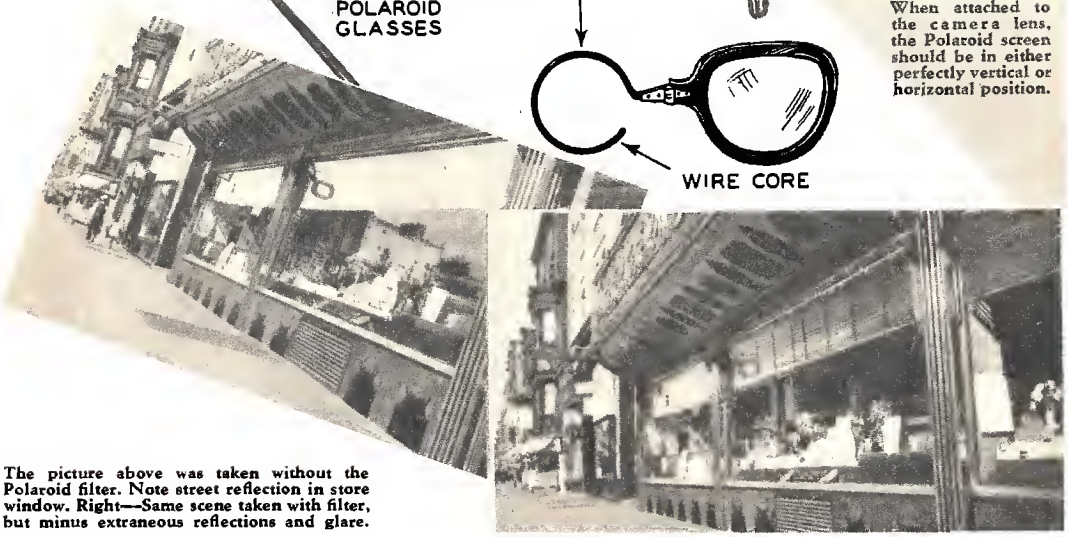
Used on a camera, these glasses can eliminate unwanted glare and reflections from horizontal surfaces when held against the



Polaroid spectacles can be made into permanent lens filters by cutting away the nose piece and heating and bending the temple pieces to form lens clip as shown.



When attached to the camera lens, the Polaroid screen should be in either perfectly vertical or horizontal position.



The picture above was taken without the Polaroid filter. Note street reflection in store window. Right—Same scene taken with filter, but minus extraneous reflections and glare.

Glareless Pictures

by Andrew Vena

camera lens in a horizontal position. Vertical reflections, of course, require that the glasses be held over the camera lens in a vertical position.

The accompanying photographs show different scenes, each taken twice; first without the Polaroid filter and then with it. Note that in the pictures taken with the filter all objectionable reflections are absent.

The illumination and the time of exposure were the same for each picture (1/25 second). A lens stop of *f*. 6.3 was used for all pictures taken with the Polaroid filter. A lens stop of *f*. 16 was used in taking the pictures that did not use the filter. It should be remembered that in all instances pictures taken with the filter should have a stop opening of four times that required for normal snapshots.

In taking pictures with the Polaroid filter, the glasses may simply be held before the lens, if the camera is mounted on a tripod or other stationary support. If a more permanent filter adapter is desired, the spectacles may be cut in half and the temple pieces bent to form a clip for attaching to the lens housing in the manner shown in the accompanying illustrations. A single pair of Polaroid spectacles will thus make two inexpensive filters.

The amateur photographer should exercise care in using the filter so that when attached to the camera it is in either a perfectly vertical or horizontal position. If mounted at any other angle no light will pass through the filter or else it will not

[*Continued on page* 122]

In tha top photo, reflections of objects on tha polishad table top are evident. In lowar pictura, taken with Polaroid filter, thay are not visible.

The effectiveness of tha Polaroid spactaclas in aliminating reflactions and glara from snapshot pictures is made evident in these pictures. The picture at laft was takan without the filter. The photo above, using tha filter, shows no reflactions. Always ramember that the Polaroid filter must be mounted ovar tha camara lens in a perfectly vartical or horizontal position. Otherwise, no image will be visibla on negative when developed.

A Clothespin Synchronizer

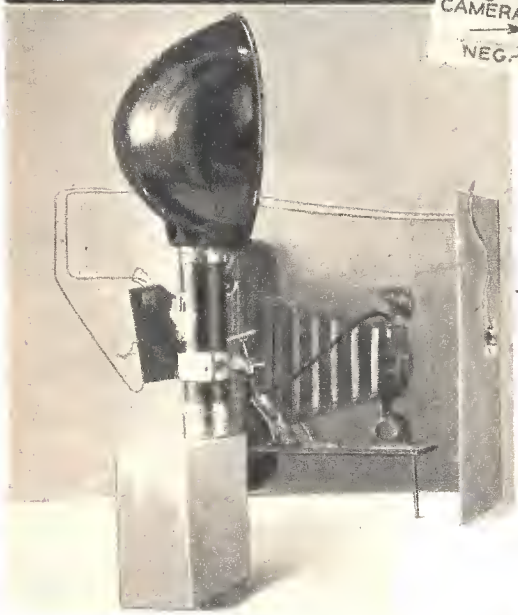
by Dr. C. W. Clifford

ALL amateur photographers will welcome this homemade device because it provides for independence of light conditions at all times.

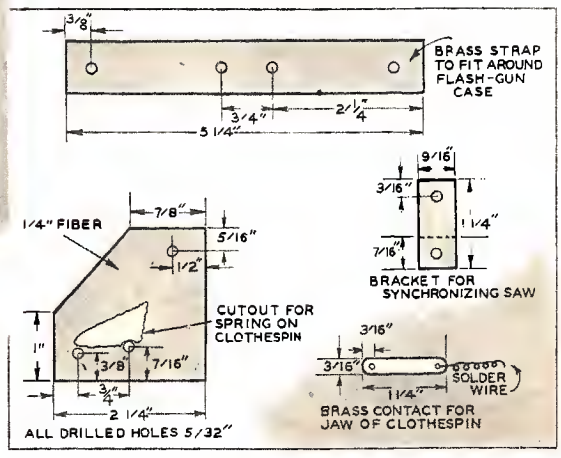
Get an ordinary flash reflector, the 98 cent variety, complete with fiber case and battery. By constructing a synchronizer to work in conjunction with the reflector battery switch and camera shutter, it will open many new ways to make story-telling and human-interest shots. The accompanying illustrations show how this inexpensive synchronizer is made from a spring clothespin and a few incidental parts.

[*Continued on page* 128]

Clamped to the fiber case of a flash gun, this simple synchronizer insures correct timing of shutter and bulb. The ceble release to the camera shutter inserts in a slot cut in the open end of the clothespin. When compressed, the clothespin trips the camera shutter and et the sema tiine closes flash gun circuit, firing bulb. Below—Patterns show size of parts.



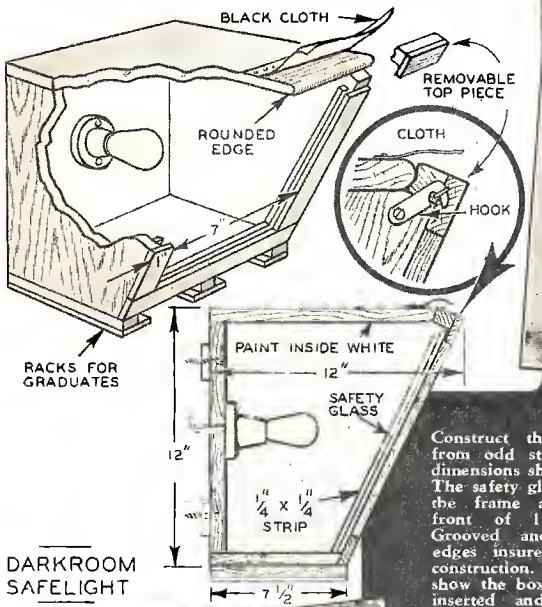
To edjust synchronizer, set shutter at 1/25 second, remove camera back and wire flashlight bulb to gun. Place bulb behind a cardboard shield, provided with a small hole, in direct line with camera lens. Adjust contact screw until light shows through back of camera when clothespin is depressed. When adjusted, lock set-screw.



Two Practical Projects For The Amateur Photographer

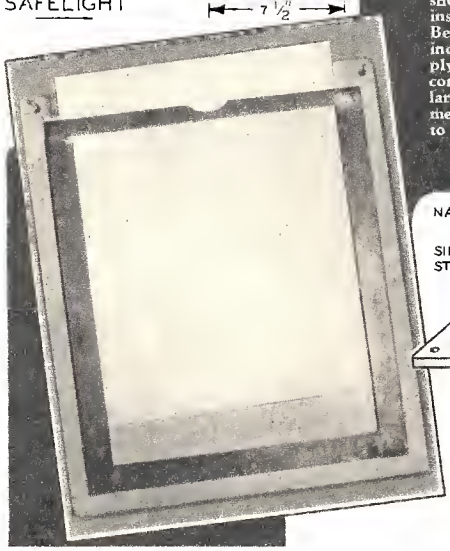
A HANDY DARKROOM SAFELIGHT

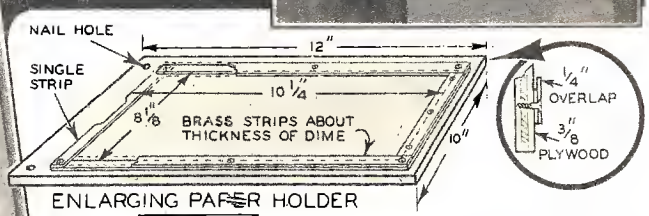
This convenient safelight is made so that the safety glass can be removed and full illumination attained when not developing. It consists of a box having a sloping front fitted with guides for inserting the safety glass. When in place, a strip fits over the glass and hooks securely in place. Grooved and rounded edges with a strip of black cloth glued over the top joint insure a light-tight housing. The inside of the safelight is painted white, after which it is fitted with a cleat type socket for a 25-watt bulb. Racks fitted to the bottom of the light provide convenient storage for graduates.



DARKROOM SAFELIGHT

Construct the safelight from odd stock to the dimensions shown above. The safety glass fits into the frame attached to front of light box. Grooved and rounded edges insure light-tight construction. The photos show the box with glass inserted and removed. Below—Strips of 1/32-inch brass attached to a plywood panel makes a convenient holder for enlarging paper. The dimensions may be altered to suit photographer's individual needs.





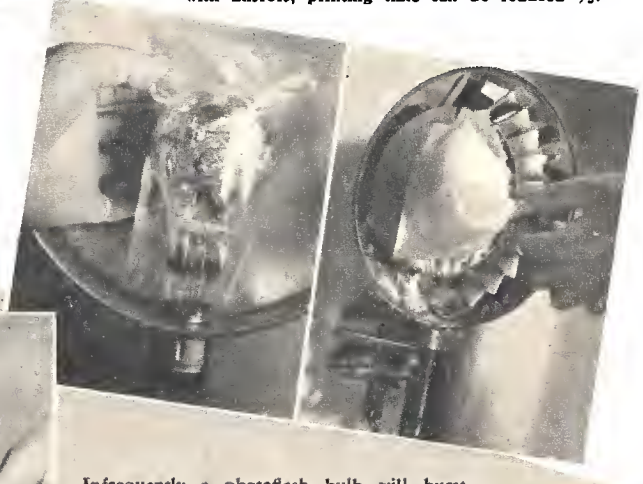
ENLARGING PAPER HOLDER

A very satisfactory holder for enlarging paper can be made from a plywood panel and brass strips in the manner illustrated. While the original was designed for 8 by 10-inch sheets, the dimensions may be altered to suit. The brass strips are about the thickness of a dime and are screwed securely to the plywood. Holes at the top of the board are for slipping over nails on the wall of the enlarging room (if a horizontal enlarger is used). The overlap of the upper brass strips determine width of border around the print.

SHORT-CUTS FOR

Where it is desired to stop motion, the normal maximum shutter speed of any good camera can be increased from 1½ to 2 times by use of a rubber band. Loop band over the setting lever and attach the other end to wire finder in manner shown. Upper left—By lining inside of enlarger lamphouse with mirrors, printing time can be reduced ⅓.

Most useful accessories for weighing up photographic chemicals are these inexpensive paper pastry cups. Due to their crinkled shape, they will hold several ounces of sulphite or carbonate without spilling. The cups insure chemical cleanliness in the darkroom.

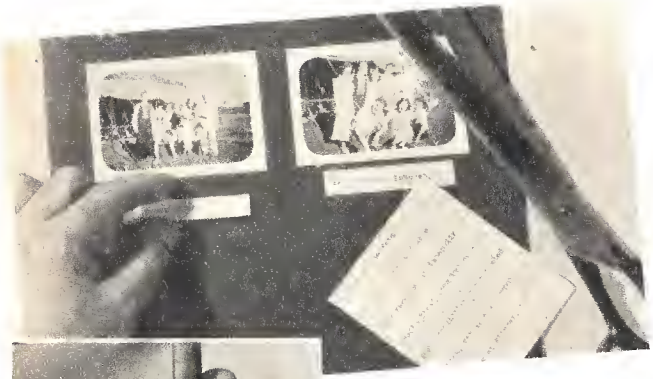


Infrequently a photoflash bulb will burst when it is ignited, due to atmospheric changes or variations in the amount of gas in the bulb. As a safeguard, slip a Cellophane bag over the bulb as shown at left. Right—A piece of tissue paper wrapped around a photoflash bulb makes an ideal diffuser.

Scratched miniature-camera negatives may be enlarged without marks showing by applying a thin coating of Canadian balsam over negative and sandwiching it between two sheets of glass. Bind the edges of the glass with photographic tape.

THE PHOTO FAN

by Kenneth Murray

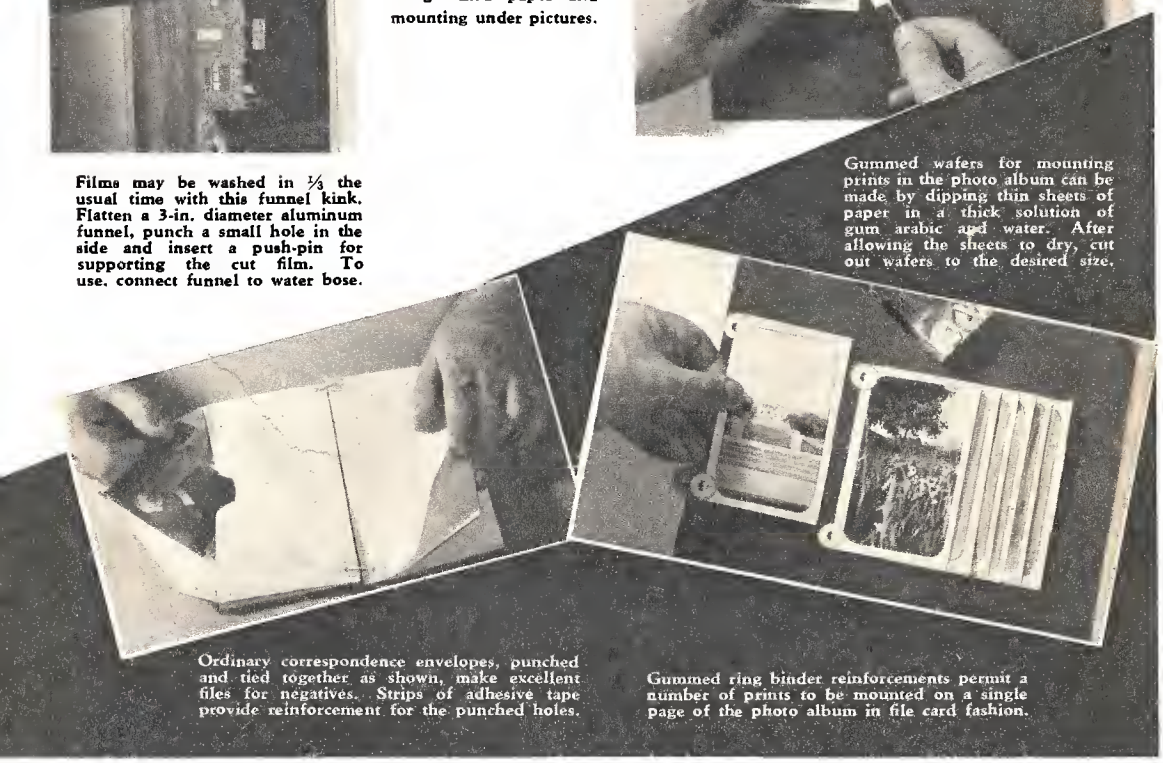


This useful handle-grip accessory will greatly simplify picture taking. It is made from an old soldering iron handle, fitted with a bolt of the correct size to fit into the tripod socket on camera.

Films may be washed in ⅓ the usual time with this funnel kink. Flatten a 3-in. diameter aluminum funnel, punch a small hole in the side and insert a push-pin for supporting the cut film. To use, connect funnel to water bose.

As white ink and pencil do not lend themselves well for titling snapsbots in the photo album, adhesive titles are to be desired. These are made by typing the data on a sheet of adhesive or gummed paper and mounting under pictures.

Gummed wafers for mounting prints in the photo album can be made by dipping thin sheets of paper in a thick solution of gum arabic and water. After allowing the sheets to dry, cut out wafers to the desired size.

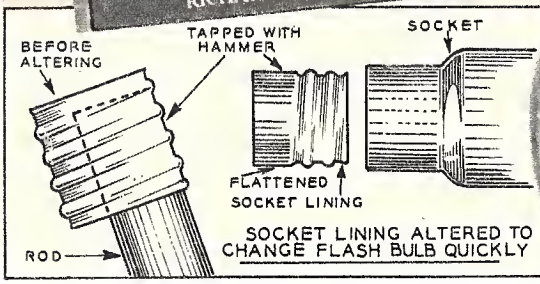


Ordinary correspondence envelopes, punched and tied together as shown, make excellent files for negatives. Strips of adhesive tape provide reinforcement for the punched holes.

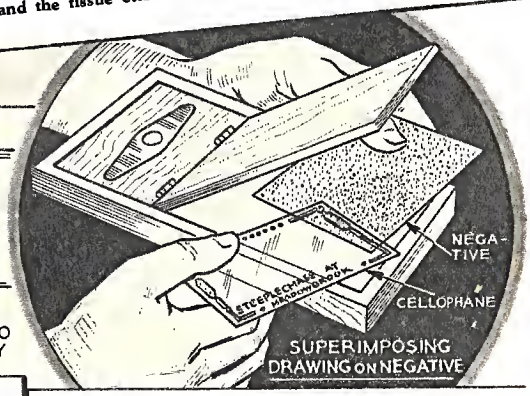
Gummed ring binder reinforcements permit a number of prints to be mounted on a single page of the photo album in file card fashion.

PHOTOGRAPHY HANDIKINKS

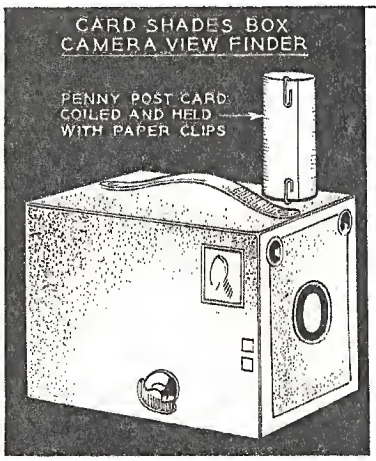
The original greeting card pictured at left consists of several individual snepshots, ell in correct proportion, pasted up on heavy cardboard and photogrephed with e copying lans attachment. The message et the bottom was lettered on white tissue and the tissue ettached to negative before prints were made.



Photographers sbooting pictures at night with photoflash bulbs can speed up insertion and removal of bulbs from the "gun" by flettening the tbreaded socket as shown here. Remove the threeded sbell from socket case end hammer out all but 3 or 4 threeds. The errangement permits removal of bulbs instently.

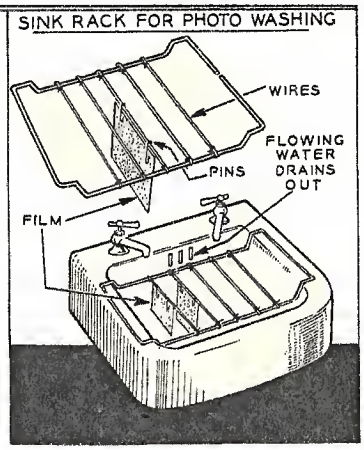


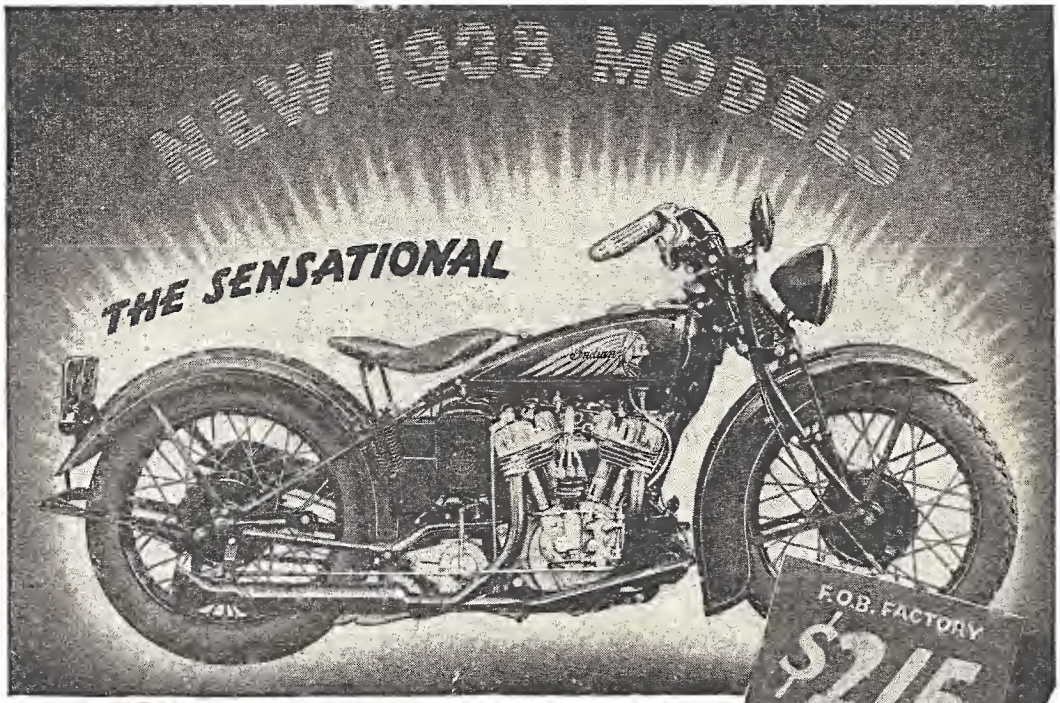
This stunt permits decorative borders or titles to be added to any negative without ectually marking up the negetive itself. Merely trace border end title on e piece of cellophane and place over negative before printing.



On bright, sunny days, when it is almost impossible to see objects through the view finder of e box cemera, the simple sbield shown et left is recommended. It is nothing more tban an ordinery postal cerd rolled into a cylinder and secured at each and with sevaral paper clips.

Tha handy negative washing rack shown at right is well edapted for the ameteur photographer's use. Formed from stiff wire, it fits over the bathroom wash bowl end provides a quick, cleen metbod for removing developing chemicals from films. They ere suspended on racks with small safety pins or clips.





Indian JUNIOR SCOUT

THE TWIN CYLINDER MOTORCYCLE MARVEL

THE NEW 1938 INDIANS ARE READY to flash you over the open road to fun and adventure! New Indian triumphs, all of them—great motorcycles built as only Indian can build them.

Heading the parade is the new Indian Junior Scout—the greatest twin cylinder "buy" in all motorcycle-dom! It's a great machine—an engineering marvel easy to handle, easy to start, with plenty of power and pep to flash you along with the leaders. And it costs so little to run—*you'll get 70 miles to the gallon easily!*

NOW OWN AN INDIAN ON EASY PAYMENTS

The Junior Scout is still the lowest priced "twin" in America! So why wait? Visit your Indian dealer today and let him tell you how easy it is to own any Indian model on easy payments.

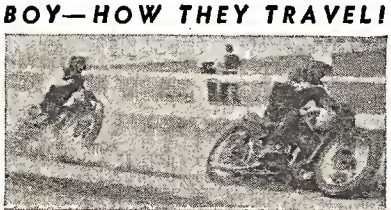
3 OTHER '38 MODELS

DE LUXE 4—the only four cylinder motorcycle made in America—quiet, smooth, comfortable.

CHIEF 74—for the rider who places a premium on "top speed" and performance.

SPORT SCOUT—a racing model for the man who wants to be a winner in sporting events, an easy-to-handle machine that's "out in front" always.

BOY—HOW THEY TRAVEL!



Get this fine RIDER'S HELMET and INDIAN PIN absolutely FREE when you place your order.

MAIL COUPON TODAY!

INDIAN MOTOCYCLE CO., Springfield, Mass.

Please send me at once, without obligation, your illustrated Folder showing the new 1938 Indian Motocycles, and CERTIFICATE of VALUE entitling me to FREE RIDER'S HELMET and INDIAN PIN, as illustrated, when I place my order. MMI

Name.....

Address.....

Please be sure to check your age group:

☐ 16-19 years ☐ 20-30 years ☐ 31 years and up ☐ under 16 years

INDIAN MOTOCYCLE CO., Springfield, Mass.

Photo Puzzlers

TAKING "MOONLIGHT" PICTURES IN DAYTIME

From time to time you have published prize winning pictures showing moonlight scenes which were actually taken during the daytime. I would appreciate more detailed information as to how I could take similar snapshots.—Ray Robbins, Houston, Texas.

There are two methods whereby moonlight effects can be obtained with daylight exposures. One consists of simply underexposing the negative so as to eliminate sbadow detail and make the print quite dark. Usually pictures made in this manner are convincing only if the "moon" (in reality the sun) is included. The sun should be partially hidden behind clouds when making pictures of this kind. When the sun can he seen through tbe clouds without discomfort to the eyes, the conditions are good for such pictures.

The second method, which is of more general application, requires the use of a deep red filter over the camera lens. A Wratten filter No. 72 is suggested. The camera should be loaded with panchromatic film and the shutter speed advanced so as to partially underexpose the picture.

CAUSE FOR NEGATIVES PARTIALLY REVERSING

In developing a roll of film recently, I discovered that one of the exposures showed a partial positive image much like the images found on movie films. Was there something wrong with the film or did I err in the processing operation?—Dudley Willard, Milwaukee, Wis.

Considerable overexposure is sometiines the cause for the partial reversal of an iinage from a negative to a positive. More frequently it is caused by the film being exposed to light during the developing operation. When this occurs it is advisable to check the safelight for leaks, or look for cracks in the darkroom through which outside light may be entering.

Often reversals are caused hy the safelight heing placed too near the developing operation. Keep it a safe distance away from where you are working. Another, hut uncommon, cause for films reversing is the presence of hypo in the developing solution. To avoid this, wash all trays well before and after using. If you will abide by the rules mentioned, future reversals will not be prohable.

GREENISH-WHITE DEPOSIT COLLECTS ON FILMS

A number of my negatives show a greenish-blue deposit on the surface which does not seem to wash off. Can you tell me tha cause of this and how it may be removed?—Edward Frankle, Flint, Mich.

The deposit on your negatives consists of aluminum sulphite and is caused by failure to keep the films moving after they were placed in the fixing batb. Usually the deposit can be removed by going over the negatives with a moistened viscose sponge or wet absorbent cotton before they have had a chance to dry. Once the films have dried the deposit can only be removed by treating them with a 1 percent solution of sodium carbonate at 80° F. To prevent damage from softening the emulsion, the films should first be hardened with a 10 percent formalin solution.

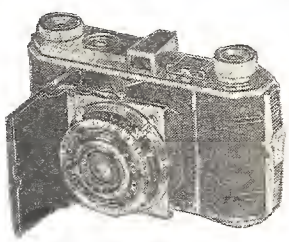
OBTAINING GOOD BLACK TONES ON PRINTS

I have experienced some difficulty in obtaining good black tones on my prints. Probably the trouble is due to my lack of knowledge in developing the printing paper, therefore suggestions would be appreciated.—Carl Doar, Portsmouth, Va.

In order that good dark tones are obtained on prints it is advisable to follow out the exact developing formula recommended hy the manufacturer, using only the quantity of bromide necessary to keep the margins of the print clear. The temperature of the developing solution should be 70° F. Expose tbe print so that it will develop out in from 1 to 1½ minutes. Good results can only be had by complete developing, using, of course, fresh chemicals. A frequent unrecognized source of poor tones on developing-out-paper is contamination of the developer with hypo. A very small trace of hypo in the developer is sufficient to effect the color of the print, making it impossible to produce rich black tones.

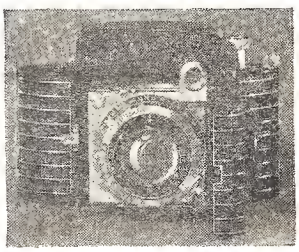
PREVIEW of Miniature Kodaks

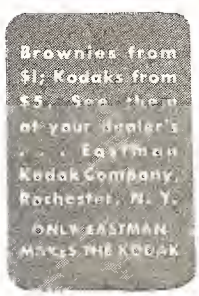
KODAK DUO SIX-20, SERIES II (*right*) New, improved—the "miniature" that takes album-size pictures (1⅝x2¼). Kodak Anastigmat *f*.3.5 lens; 1/500-second Compur-Rapid shutter. Shutter release on camera body. Bracket for range finder. Single-finger bed release. Die-cast metal body. Price remains **$57.50**



KODAK BANTAM SPECIAL (*below*) Performs brilliantly under all conditions. Lens, Kodak Anastigmat EKTAR *f*.2.0. 1/500 Compur-Rapid shutter. Coupled range finder, military-type, split-field. Negatives are needle-sharp, yield superb enlargements. Also makes full-color transparencies on Kodachrome Film. Price **$110**

KODAK RETINA (*above*) Lens, Kodak Anastigmat EKTAR *f*.3.5. 1/500 Compur-Rapid shutter. For black-and-white pictures: Kodak "SS," Panatomic, Super X, Infra-Red Film. For full-color transparencies: Kodachrome Film. (Negatives approximately 1 x 1½ inches.) Film-measuring device. Exposure counter. Price **$57.50**



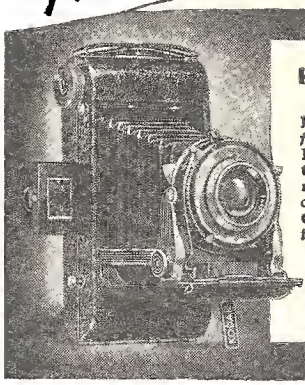


KODACHROME FILM FOR FULL-COLOR "STILLS"

Load with Kodachrome and get full-color transparencies to be viewed as they are, or mounted for large-size projection. Easy as black-and-white. No. K828 or K828A (8 exp.) for Kodak Bantam Special, $1.35; No. K135 or K135A (18 exp.) for Kodak Retina and similar cameras, $2.50. Prices include processing.

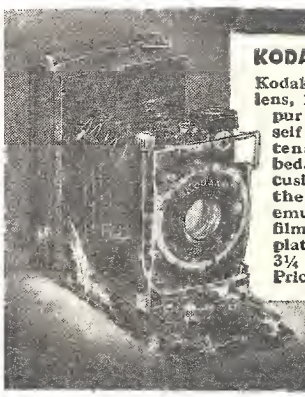
your Kodak dealer's Christmas suggestions...

Precision Kodaks



KODAK SENIOR SIX-20 (f.4.5)

Kodak Anastigmat *f*.4.5 lens; 1/200 Kodamatic shutter. Body shutter release minimizes camera movement. Optical, direct-view finder helps you get the picture when it's exactly right. 2¼x3¼-inch pictures. Price **$29.50**



KODAK RECOMAR 18

Kodak Anastigmat *f*.4.5 lens, 1/250-second Compur shutter. Built-in self timer. Double-extension bellows and bed. Ground-glass focusing back. Utilizes the almost limitless emulsions available in film packs, cut film and plates. Pictures, 2¼ x 3¼ inches. Price **$54**

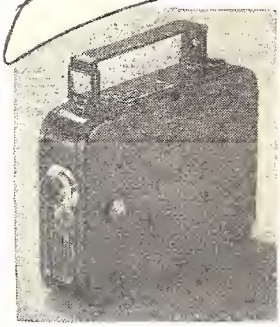
KODACHROME FILM FOR FULL-COLOR MOVIES

Loaded with Kodachrome Film, all Ciné-Kodaks make gorgeous full-color movies. They are easy to make as black-and-white. No extra equipment; the color is in the film. Here are beauty and realism impossible to describe. The projection of Kodachrome is thoroughly trouble-free. You can splice color sequences right in with black-and-white. See a Kodachrome reel at your dealer's. 16 mm. cameras load with 100-foot rolls at $9, 50-foot rolls at $4.75, 50-foot magazines at $5. Rolls for Ciné-Kodak Eight cost $3.75. Prices include processing.

Ciné-Kodaks

CINÉ-KODAK EIGHT

(*right*) Movies at only "10 cents a shot." Ciné-Kodak Eight makes it possible. A roll of Ciné-Kodak Eight Panchromatic Film costs you only $2.25, *finished, ready to show*. Good for from 20 to 30 black-and-white movie "shots," each of newsreel length. Price **$34.50**



$48.50

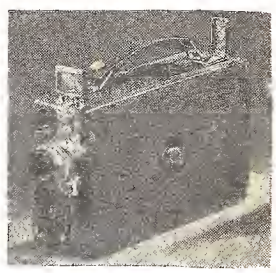
CINÉ-KODAK "E"

(*left*) An Eastman 16 mm. movie camera at the lowest price ever. Kodak Anastigmat *f*.3.5 lens. Fixed focus. Triple-speed device. Simplified gate enormously facilitates loading. Takes all 50- or 100-foot 16 mm. Ciné-Kodak Films. Price, $48.50.

CINÉ-KODAK "K"

(*right*) World's most widely used 16 mm. home movie camera. Makes clear, brilliant movies at the touch of a lever. Performs beautifully for the beginner, and as his skill increases, responds to every exacting demand. Loads with full 100 feet of 16 mm. film. With *f*.1.9 lens. **$88.50**

Including carrying case, $100.



$125

MAGAZINE CINÉ-KODAK

(*left*) Loads in three seconds. You don't touch the film at all—it comes in a magazine. Just slip the magazine into place, close the camera cover and you're ready to shoot. To switch from one film to another, you merely take out a partly used magazine, slip in one of the others. Effortless loading is only one of the six new features in this remarkable pocket-size movie camera. Equipped with fast *f*.1.9 lens, $125; including combination carrying case, $137.50.

Martin—"Early Bird" Aviator

[*Continued from page 60*]

Curtiss Marine Trophy for covering the greatest number of miles in a single day of flying.

During the same year the U. S. Army held its first bomb-dropping experiments, using Martin planes, and with the prospect of future government orders, Martin quit building planes for private use and concentrated on the production of military types.

In 1929 the Martin concern was moved to a superb new plant at Middle River, Baltimore, Maryland. Located on a 1,234 acre tract and employing some 1,200 men, it is rated as one of the largest privately-owned aircraft factories in the world.

It was at this new plant in 1932 that the famous Martin B-10 and B-12 bi-motor monoplane bombers were developed for the Army. These bombers completely changed bombardment aviation, in addition to upsetting international air-fleet balance and revising pursuit aviation tactics.

For his work in developing these bombers, Martin was awarded the Collier Trophy for 1933. (Martin "Clipper" planes helped Pan American Airways earn the 1936 Collier Trophy.) This trophy, which is ranked as perhaps the greatest in aeronautical science, is awarded annually for the greatest achievement in American aviation as demonstrated in actual practice during the year. Under the trusteeship of the National Aeronautical Association, the trophy has been awarded to other great aviation leaders in this country such as Wright, Curtiss, Sperry, Burgess, Hoffman, Reed, Lawrence and Douglas.

In addition to the planes mentioned, Martin has built many other types, outstanding among which are his famous dive bombers BM-1 and BM-2, which were developed for the Navy for aircraft-carrier work. His torpedo planes T4M-1, XT5M-1 and XT6M-1 are very important Navy service types. For the Navy Martin has also been particularly successful in developing big patrol craft for long-distance, non-stop flying. Perhaps the best known of his patrol boats are the PM-1 and PM-2, both twin-engine biplane types, and the P3M-1 and XP2M-1 monoplane boats. These last two craft are tri-motor jobs. At the present writing, Martin is engineering a new trans-ocean transport flying boat which will be considerably larger than the present "Clippers."

The new Martin Clipper will be designed to carry 285% more pay load than the China Clipper, although its gross weight will be only 19% greater and its wing span 21% greater. To be known as the Model 156, the new giant flying boat will have a faster take-off due to the use of a new low drag-high lift device developed by Martin. Now rapidly nearing completion, the Model 156 will be another tremendous step in the conquest of the oceans by air.

Glenn L. Martin has won for himself a great

[*Continued on page 120*]

Science Saves Eyesight

[*Continued from page 39*]

the body where the living brain may be observed. This fact makes it of vital importance in diagnosing many other diseases than those of the eye. A brain tumor, for instance, often betrays its presence through the condition of veins and arteries of the retina. Kidney disease, anemia, certain stages of diabetes and many other diseases leave important symptoms in the retina. Such is the vital organ whose examination the ophthalmoscope made possible.

In the past two decades the binocular ophthalmoscope has partially replaced the older hand type. The retina area can be observed in three dimensions by the binocular instrument, which does not differ in fundamental principle. Instead of a flat view of the fundus, the binocular instrument obtains a picture with depth, magnified some 16 times, enabling the topography of the retina to be studied.

Similar in appearance to the hand ophthalmoscope is the retinoscope, a device which enables refractive lenses to be prescribed without the cooperation of the patient. It is often used in prescribing lenses for children or for illiterates who cannot read the alphabet on test cards. Babies as young as ten months have been fitted accurately with glasses—so accurately that the infants cry for them if mother neglects to put them on.

Optical principles on which the retinoscope is based are extremely complicated, but in practice the examiner determines the strength of corrective lens which is needed by throwing a narrow beam of light into the eye from the retinoscope and observing the direction of movement of the light spot and its accompanying shadows as the light beam is moved across the eye.

Your eye has several fields of vision, one for each primary color. Certain nerves are sensitive to blue, red, and green light respectively. Out of these three primaries all sensations of color are derived. All three primaries in combination give white, their total absence, black, and yellow and purple and other hues are merely combinations of the primaries in varying proportions. This fact is the basis of all systems of color photography.

"Visual fields" do not refer to depth of vision, or acuity, but to absolute area. If your eye is average, the widest color field is for blue, then red, with green the smallest. In certain eye diseases, such as glaucoma, the visual fields are important guides to diagnosis. One instrument for measuring these fields is the Ferree-Rand Perimeter. The patient sits with his face on a chin rest, one eye masked, and focuses on a fixation point while the examiner moves a test object along a semi-circular frame. The point at which the object can be distinguished as to color marks one boundary of the visual field for that hue.

Another instrument serving a similar purpose is the Stereo-Campimeter. In this device the patient looks through binocular lenses at a stage,

[*Continued on page 132*]

The Magic *of Mind*

THE STRANGE POWERS of mind were known to the ancients. From every land they trekked to the caves of the oracle. In her presence they were imbued with the mysterious faculty of foresight. She brushed from their mental vision, fear and misgivings. Deep within their consciousness she implanted illuminating ideas with which they went forth to accomplish the seeming miracles history records. Were these geniuses of the ancient world, Pericles, Socrates, Alexander the Great, merely deluded, cast under a fantastic spell, or *can the human mind truly assert an influence over things and conditions?* Is there a wealth of infinite knowledge just beyond the border of our daily thoughts which can be aroused and commanded at will?

It is time you realized that the rites, rituals and practices of the ancients were not superstitions, but subterfuges to conceal the marvelous workings of natural law from those who would have misused them. Telepathy, projection of thought, the materializing of ideas into helpful realities, are no longer thought by intelligent persons to be impossible practices, but instead, *demonstrable sciences,* by which a greater life of happiness may be had.

Dr. J. B. Rhine, foremost psychologist and university instructor, says of his experiments with thought transference and the powers of mind—"The successes were much too numerous to be merely lucky hits and one can see no way for guessing to have accounted for the results." *Have you* that open-minded attitude of today which warrants a clear, positive revelation of the facts of mind which intolerance and bigotry have suppressed for years? *Advance with the times;* learn the truth about your inherited powers.

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How To Select A Shotgun

[*Continued from page* 81]

selecting a shotgun is the length of the stock itself. How often we find a short-armed man shooting a shotgun with a stock too long for him, or a long-armed man with a stock too short! Unless one is acquainted with this need of the right length of stock on the shotgun, he will be utterly in the dark as to what hinders him in his shooting. When the stock on the gun is absolutely right, one is able to swing the gun to shoulder instantly, assume position with it and fire. If one has to feel around to adjust the gun to his shoulder, there is something missing in the arrangement.

Length of gun-stock is measured from the center of the gun-butt to the trigger. If the gun is a double-barrel, with double trigger, then the measurements are reckoned from the forward trigger. Probably 50% of all shotgun users would do well with a stock measuring 14 inches in length. Others who are fairly tall, and with a good reach, may take a stock that ranges from 13¼ to 14½ inches in length. Large men, having long arms, may require a stock ranging from 14¾ to 15 inches in length. The demonstration guns in use in gun stores are valuable in assuring the purchaser of getting the correct stock length and correct drop at heel and comb. These guns, however, are valuable only if the shooter throws the gun into position each time in the same identical manner as the last, that is, with cheek to comb and butt to shoulder. If the shooter has acquired this knack and does not handle the gun differently each time, he can easily determine which gun suits his needs best.

Where a gunstock needs to be lengthened, it is possible to gain the required length simply by adding recoil pads, either the ventilated rubber type or the sponge rubber variety in the shape of a leather guard that slips down over the gun butt and laces under the gunstock. While recoil pads are most valuable on duck and goose guns, where muzzle blast is most pronounced, still it will be found that any shotgun outfitted with a pad gives one the maximum of comfort, aside, of course, from the fact that it also extends the stock to the desired length.

Assuming that most shooters are about 5 feet 8 inches in height, it will be found that best shooting can be obtained with a gunstock 14¼ inches in length with the drop at heel being 2½ inches and at comb, 1½ inches. For a chunky-built, deep-chested short fellow, the drop of the stock at heel should be about 2¼ inches and the stock about 13¾ inches. The tendency of the upland hunter is more and more toward the gun with a uniformly straight stock. He is likely to find a gun with a drop of 2 inches at heel and 1½ inches at comb ideal. A six-foot man, or taller, will find a gun that has a stock of 14¾ inches with a 2¾-inch drop at the heel ideally suited for him. Shotguns for goose and water-

[*Continued on page* 129]

Martin—"Early Bird" Aviator

[*Continued from page* 118]

and lasting place in aviation. He is one of the very few pioneers who still head the companies which they founded. In addition to his other honors, he is a Fellow of the Royal Aeronautical Society of England and a member of the National Aeronautical Association, having served as governor of Ohio and Maryland for the latter organization. He is also a member of that famous fraternity, the Early Birds, as well as of the Institute of Aeronautical Sciences. In 1931 he delivered the Wright Memorial Lecture to the Royal Aeronautical Society in London. The right to deliver this lecture is an honor accorded only once each year to one of aviation's leaders.

[Editor's Note: The present generation of hopeful inventors will find real inspiration and encouragement in the life stories of men who are now famous in the world of science. MODERN MECHANIX has been running a special series of these articles, which should be read by every man who has ideas and expects to capitalize on them sooner or later. The October, 1937, issue had a history of Donald Douglas, the plane builder; the September issue, William Dubilier, noted radio-electrical inventor; the August issue, Colin Fink, famous physicist; the July issue, Carleton Ellis, renowned chemist.

Readers who missed any of these issues can obtain back copies directly from the Circulation Department of MODERN MECHANIX, Fawcett Building, Greenwich, Conn., at the regular price of 15 cents each.]

Radium From The Arctic

[*Continued from page* 43]

Bear Lake, dug deep under the Arctic lake, built cabins, bunkhouses, power stations, mine railways, and imported thousands of tons of mining machinery, a system was being worked out by Pochon to get the radium out of the ore in the cheapest way possible. They even went so far as to meet competition from the Belgian Congo by flying their ore to the railroad, one thousand miles away.

Chemical processes were developed, safety standards for handling the ray-emanating mineral were established, and month by month, the production men became more efficient, cut down costs. Towards the end of 1936, after three years of work, they finished producing the first ounce of Arctic radium, and by that time had production costs down so fine that the radium is now selling at the refinery in platinum and lead needles and cases at $30,000 a gram. (It takes 20 tons of chemicals to procure a single gram of radium from 6½ tons of pitchblende.)

Silicosis, a lung disease contracted in dusty occupations, is called the greatest single occupational hazard in this country.

Each tin proves it over and over again..

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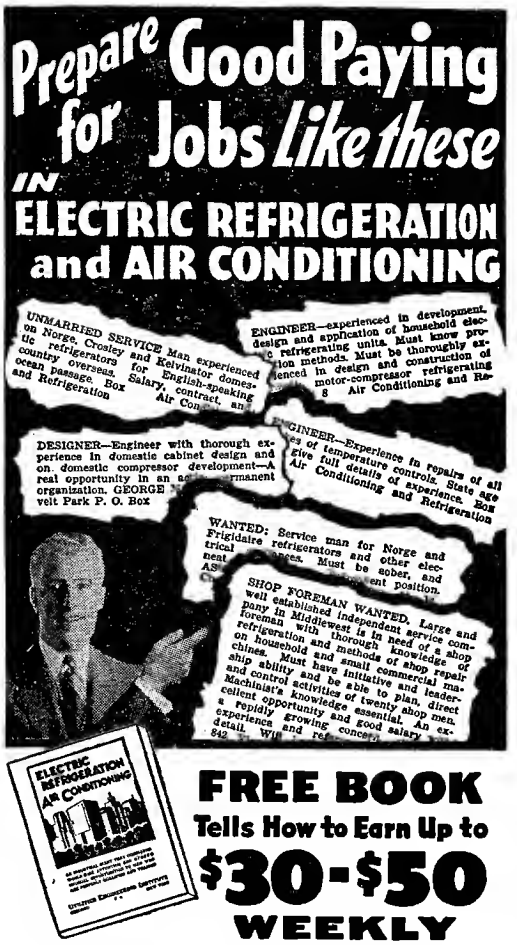
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Photographic Monstrosities

[*Continued from page* 104]

or eight inches from the subject, was used in making the "monstrosities."

Probably everyone has noticed the peculiarly distorted effects seen when looking at the reflections in the curved, polished surface of an automobile headlight, lamp reflector or similar object. What can be seen can be photographed, so by setting up a camera so as to bring it within close focus of one of these surfaces, surprising pictures will result.

In making the photos shown in this article, the photographer used the rounded bowl surface of a brightly polished silver spoon. The spoon, as can be seen in the explanatory photo, was held steadily in place on the table by forcing the handle into a slot cut in a small cardboard box.

The subject, seated in a chair, placed her face within an inch or two of the spoon's surface so as to produce a greatly distorted reflection in the convex bottom. The camera was placed so that this reflection was greatly distorted by the convex bottom.

The camera was arranged so that this reflection could be photographed without the subject being included in the picture. This required the camera being placed close to the spoon so that the distorted reflection covered nearly all of the ground glass focusing screen. While artificial lighting was used to obtain the brilliant effects shown, natural daylight, from a window, can be used with equal results. To improve results, a black background should be placed behind the subject to ward off extraneous light.

After taking the pictures, best effects will be obtained by enlarging the images so that the edges of the spoon are excluded from the prints. This will give them a puzzling effect, making it difficult for anyone to guess how they were made.

Other curved surfaces can be used to produce photo "monstrosities." The outside of highly polished auto headlights and the mirrored balls such as used for lawn decorations both yield unusual effects. In all cases, the subject must be very close to the reflecting surface for greatest distortion and the camera placed so as to eliminate the image of the subject itself.

Polaroid Glass Clears Pictures

[*Continued from page* 109]

serve its intended purpose. Two scratch marks on the lens housing will serve as true positions at which the filter should be used. It is also important that the camera be held approximately true in relation to the surface from which the glare or reflections are to be eliminated.

Study the scene to be photographed and observe lighting, glare and reflections by looking through the Polaroid screen before placing it over the camera lens. Doing this will insure the best angle and position for securing a satisfactory exposure.

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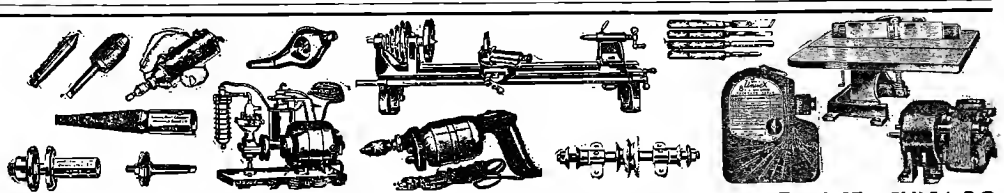

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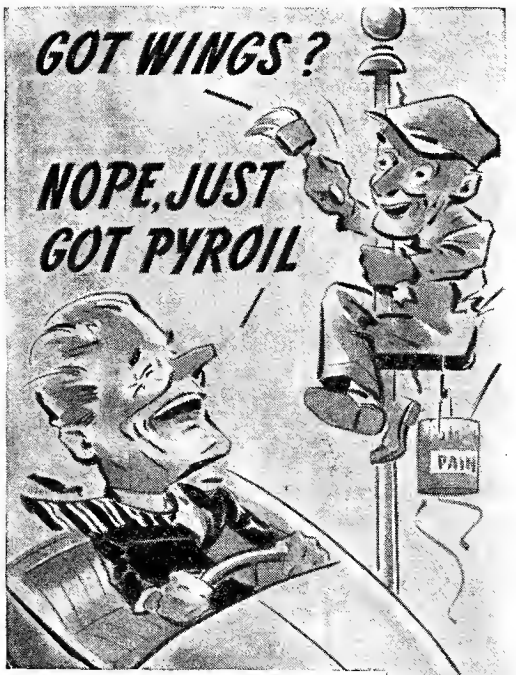

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Commemorating Graf Flights

[*Continued from page* 70]

would become a most fascinating book, and be very historical. Few countries honor the creations and inventions of any other land, but the instance of the *Graf Zeppelin* is an exception to the rule. Even our own country has pictured this dirigible on air-stamps. Italy and its colonies have issued a series for the *Graf*. Paraguay has both overprinted stamps as well as regular issues for this airship.

The album devoted to "*Graf* Stamps" might be arranged by countries, Germany leading, with a second section following devoted to covers from the *Graf*. The pages of such an album, being blank, could be easily annotated. Brief remarks about the stamps showing the *Graf*, year of issue and extent of flight which resulted in their being issued, would be welcomed information. Those collectors interested in aviation and air-stamps will find the field captivating.

Holiday Decorations In Home

[*Continued from page* 74]

or similar covers with shiny surfaces, and lighted by natural or colored lamps. Locate these above the line of vision, from the four corners of the room, with a different color in each corner. Flashers, such as used on the tree, enhance the effect. Indirect lamps may also be used effectively. Socket adapters are used for colored or natural lamps. Color may be had without changing the floor lamp, by placing colored celoglass screens over the top of the shade.

None of the decoration schemes described involves any great expense. Variations from the original designs can be used if they better suit into the decorative arrangement of the particular home in or about which they are to be used. Careful study of the homes pictured in the accompanying illustrations will provide the craftsman with numerous ideas.

Station Operates By Battery

[*Continued from page* 100]

is adjusted for the desired antenna load and then resonance is restored by rotating the plate condenser. A six-volt dial light bulb, soldered to a small loop of wire, is a useful tuning aid.

With the circuit as shown 275 volts is the maximum safe plate and screen voltage. By adding a tapped voltage divider to keep the screen voltage at 275 volts, however, plate voltage may be raised to 375 volts, with a considerable increase in output.

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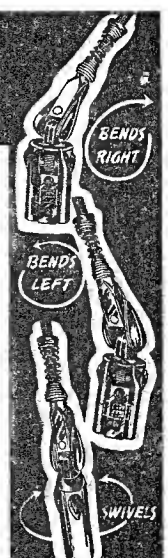

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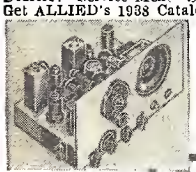

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Build A Model Ocean Airliner

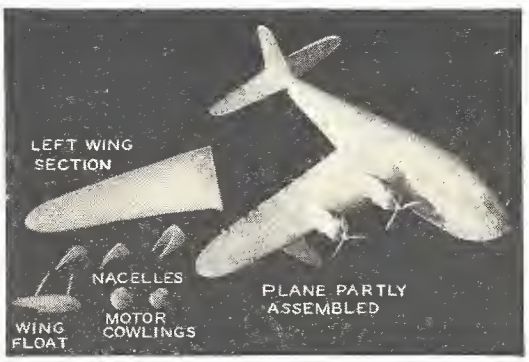
[*Continued from page* 86]

work on the wing. Make it in two pieces, each measuring ⅝ by 3 by 6¾ inches. Note that the stock is slightly larger than the completed panel so as to insure maximum safety in construction and a better fit between wing root and hull. After the wing has been shaped and tapered as shown in the top and front views, refer to the sectional diagrams and commence to shape the airfoil section. With the aid of a sharp knife cut away the surplus balsa and with sandpaper, finish off the panel to give it the desired airfoil.

When both panels have been completed make the four engine nacelles. These are of soft balsa with the construction method similar to that of the fuselage.

The nacelles are carved from a ¾-inch square nave block and are each 1¼ inches in length. After the top and sides have been shaped and the nacelles rounded, cut out the slot for the wing. The true shape of the slot is shown at sections G-G and F-F in the accompanying details. Should the builder experience difficulty in carving out the slot, it is advisable to slice the nacelle horizontally and thus carve the slot in each half separately. After this operation has been completed the two halves are cemented together and the nacelle secured to the wing.

While the nacelles are drying to the wing,



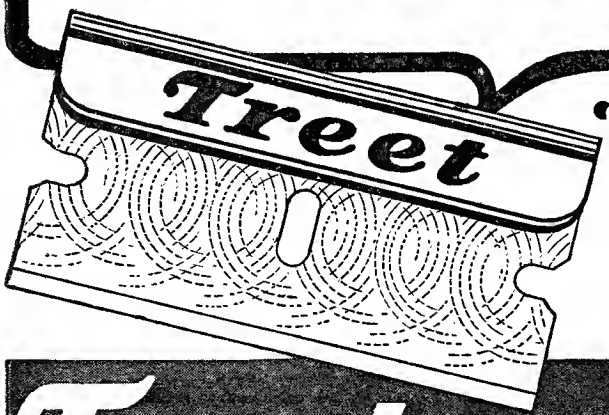
proceed to construct the cowlings. Each cowling is carved from a ¾-inch square nave block, ⅝-inch long. They must be shaped as shown in the drawings and grooves cut to indicate the engine cooling flaps. After completion, the cowlings are cemented to the nacelles and allowed to dry.

The wing panels are now cemented to the hull and the roots filleted with plastic wood. Make certain that the same amount of dihedral has been given to each wing panel and that each is in line. Allowing the fillet and the cement to harden, continue on to the wing floats.

Each float is carved from a ⅝-inch square nave block of balsa, 2⅜ inches long. Upon completion of the floats, make the struts that are to connect

[*Continued on page* 151]

"OH BOY-AM I KEEN!"



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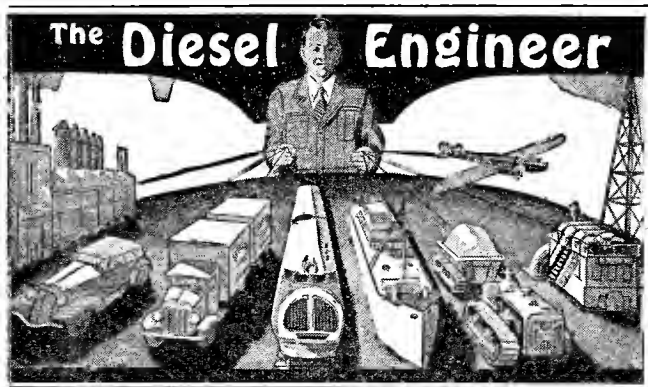

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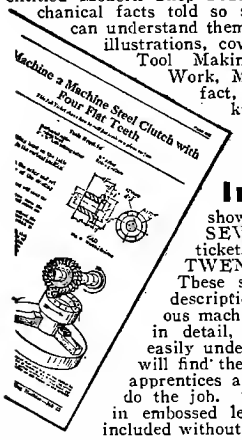

This is a reproduction of one of three job ticket pages showing how to mill flat teeth in a plain surface. In these pages are listed the tools required and a complete description of each of the seven operations.

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Please attach a letter stating age, occupation, employer's name and address and that of at least one business man as reference.

A Clothespin Synchronizer

[*Continued from page* 110]

A piece of fiber, 2¼ by 2¼ inches, is shaped as shown, and the parts mounted on it. Bore two holes in the clothespin for mounting it to the fiber board, fastening it with ⅛-inch machine screws. These same screws are also used to hold the metal clamp which fits around the battery case.

In one end of the clothespin, make a hole and slot large enough for the plunger of the camera shutter cable release. A flat piece of metal is attached to the top of the clothespin with a small screw to form part of the timing mechanism contact.

A piece of copper or brass, $\frac{9}{16}$ by 1¼ inches, is drilled and bent L-shaped to hold the adjusting screw. A nut is soldered to this bracket to accommodate the contact adjustment screw. Once adjusted, the screw is locked in position with an additional nut. The adjustment screw must be set so as to make contact with the metal piece on the top of the clothespin just as the shutter is opened by the cable release.

Solder one end of a length of No. 22 gauge insulated copper wire to the metal strip on the top of the clothespin and the other end to the screw cap on the bottom of the flashlight case. Then solder similar wire to the brass or copper L-shaped bracket to which is fitted the screw adjustment. The opposite end of this wire passes through a hole drilled in the fiber flash case and is soldered to the shell of the flash bulb socket. Although this arrangement wires around the flash case switch, it does not render it useless. As both clothespin contact and flash-case switch are wired in parallel, either can be used independently to fire the flash bulb.

To synchronize the clothespin switch, proceed as follows: Remove the back of the camera, temporarily connect a small flashlight bulb to the gun and place it behind a cardboard shield provided with a small hole to align with the center of the lens. Screw in the synchronizer bolt until light is seen through the back of the camera when the shutter opens. Use a shutter speed of 1/25 second. Once the correct adjustment has been determined, lock the adjustable contact screw in place.

Vest Pocket Chess Board

[*Continued from page* 96]

constituting the top and bottom of the box.

The playing pieces, which are made next, consist of two sets, one turned from walnut and the other from maple.

For each set eight Pawns, two Horses, two Bishops, one King, one Queen, and two Castles will be required. Turn the playing pieces so that they correspond in design with the conventional types and allow a short stem to remain on the bottom of each piece so that they can be inserted in the holes drilled in the checkered board.

How To Select A Shotgun

[*Continued from page* 120]

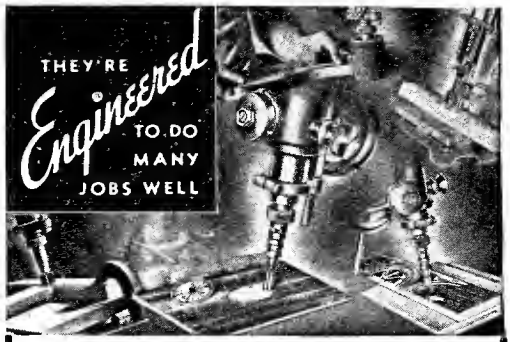
fowl shooting in general can be uniformly selected with a drop at heel of 2½ inches and with drop at comb of 1⅝ inches. These specifications will take care of most hunters who go into the field. It should always be remembered that if there is too much drop in the stock there will be an inevitable tendency to shoot low. By the same token, the straighter the stock, the higher the gun will shoot. It is the concensus of opinion among shotgun authorities that the straighter stock is the best for all-around shooting, especially upland shooting, where the game is almost always taken on the rise upward. If the gun, by reason of its straight stock, naturally shoots high, there is no need for raising the gun very much in order to cover the rise in heading off the bird with the shot pattern.

The pitch of a shotgun has been described variously as "the divergence of the barrels from a right angle with the butt plate" or "the angle of the butt in relation to the line of sight over the barrels or rib." There are those who discount the value of pitch in a shotgun, but it is generally recognized as one of the essentials.

The method of assuring yourself as to the pitch, heel and comb drop can easily be determined by standing the gun up against a perfectly straight wall, being sure at the same time that the floor is likewise perfectly level. The heel and toe of the butt of the gun should rest flat on the floor, after which the gun is pushed forward until the top of the breech rests against the wall. The distance, between the heel of the stock and the wall, is then reckoned; also the distance between the comb and the wall and the distance from the muzzle to the wall. While the depth of the drop at heel and comb has been covered, the pitch is still to be considered. Pitch, so far as a gun used on waterfowl is concerned, should be approximately 2¼ to 2½ inches. On the other hand the pitch for an upland gun, best on quail, pheasants and grouse would range from 1¾ to 2 inches.

While the drop at the heel and comb of the gunstock have much to do with the effectiveness of the shotgun, in the field, there is also need of considering the length of the gun barrel. Mention is made of this because it is one question that is invariably asked by the amateur. It seems that there is a misconception cleaved to by most beginners which has for its theme the theory that the longer the barrel of the shotgun the more effective it is. The fact of the matter is that the long barrel is no more effective, nor harder hitting, than the short barrel. Whether it is a 26-inch barrel or a 30-inch barrel, neither length can claim much preference over the other. The only difference here would be in shooting heavy loads, when the shorter barrel would of course produce a more excessive recoil. This muzzle blast is counteracted by the use of a longer barrel.

[*Continued on page* 137]



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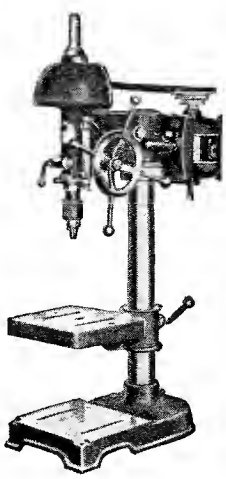

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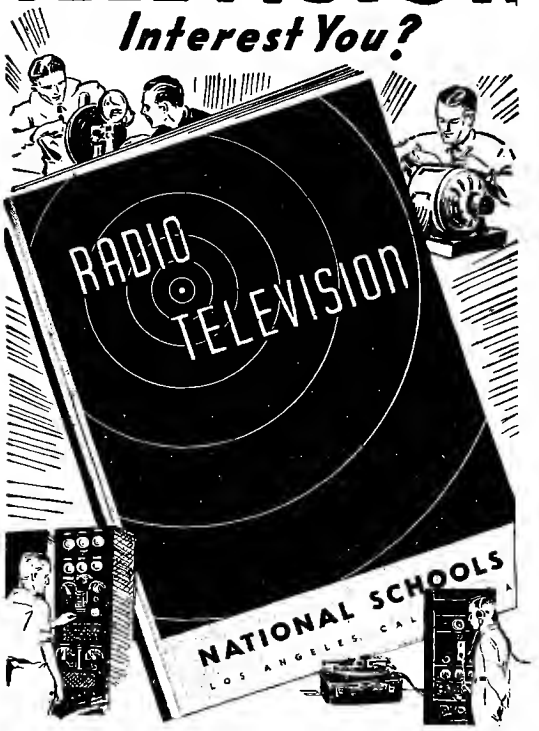

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Make This Xmas Tree Base

[*Continued from page* 77]

the laths and extend over the outside boards, folding underneath about 1 inch. After fitting the burlap, cut small holes at the location of the tunnel openings. Do not as yet cut them to exact size because when applying the plaster saturated burlap it may not come just as planned.

Proceed by mixing water and casting plaster (plaster of Paris) in a bucket until it is thick. Dip the burlap into the plaster until the pores are filled. Take it out immediately and place it on the stand, forming it to the shape desired. Fold the burlap over the outer boards and tuck under edges. Work quickly because the plaster dries fast. It takes only about ten minutes for it to dry so hard that it cannot be worked.

With a pair of sharp scissors or a knife, trim the burlap to make the tunnel openings, allowing a half inch for folding to the inside. Next place the track in position. The plaster will hold it down. Cut a hole at the opening of the tree holder and tuck the edge of the burlap inside.

More can be added to the set-up by placing a piece of green pebbled art glass at any desired place. This will give the appearance of a miniature lake.

A coating of the plaster must now be placed over the entire surface of the stand, building it up to cover any burlap surface still appearing and to hold the track and glass in place firmly.

The stand is now completed except for decoration, which you can add to give it increased beauty and life. Novelty and five and ten cent stores stock a variety of sizes of miniature Christmas trees. These range in size from one to several inches high and are covered with a substance that resembles snow. A number of these trees in varying sizes can be stuck into the plaster, to add to the decoration of the base.

Miniature people and houses can be obtained and placed near the lake edge or on the "mountain" slopes. Small animals such as deer also add to the appearance of the stand.

This Christmas tree stand can be used for many years if properly stored between seasons. Paper wrapped around it will protect it from dust. If it should become dusty, brush the dust off and apply a coat of whitewash to restore it to its original condition.

White House Talks To World

[*Continued from page* 66]

Should the President phone Europe, the call, after passing through the trans-Atlantic terminal at New York, would travel over the long-wave radio telephone circuit across the Atlantic or over three short-wave channels that were put in operation in 1928 and 1929. The terminals are at New York and London, whence connections are made respectively to the Bell system network and to the telephone systems of the various Continental countries.

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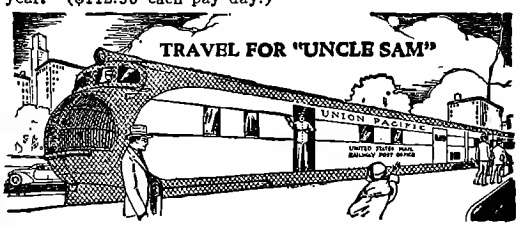

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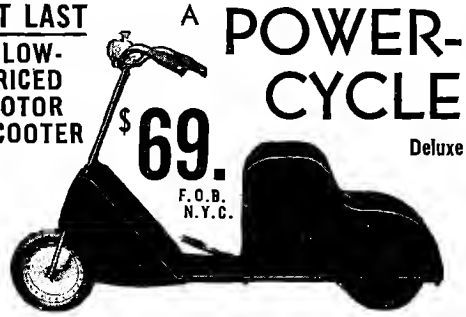

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Soap Box Winner Gets Award

[*Continued from page* 95]

Don't think that a soap box racer can't burn up the track! Bobby set a record for the 1,175-foot Akron course by covering it in the breeze-scorching time of 29.28 seconds! His car has been paced by a motorcycle policeman at 52 miles an hour. A racer has to be sturdily designed to take the gaff.

Participants in future soap box derbies, which are sponsored annually by the Chevrolet Motor Company in conjunction with local newspapers, can pick up a few pointers on speed design by studying the photographs of Bobby's prize-winning racer which he posed especially for MODERN MECHANIX.

Science Saves Eyesight

[*Continued from page* 118]

upon which test objects are manipulated to chart the fields. By the substitution of twin photographs, exactly like those used in the old parlor stereoscope, patients with squints or improperly cooperating eye muscles are aided to overcome their trouble. This is called fusion training. In squints, one eye usually does most of the work. The binocular design of the Stereo-Campimeter forces both eyes to work together and muscles are trained to proper functioning.

One of the most extraordinary instruments used by eye physicians is the slit-lamp. In effect, this marvelous machine uses a thin beam of light to slice out a section of the eye and place it upon a microscope slide for thorough examination, just as a surgeon would perform the operation with a knife. Actually it is purely an optical phenomenon.

If a cinder becomes imbedded in your eye, or if you have a beginning cataract in the crystalline lens of your eye, the slit-lamp enables the physician to determine the exact depth at which the lesion exists. The instrument consists of a powerful light source which throws a narrow beam of light to the desired layer of the eye, and this is examined from an oblique angle with a binocular microscope. With magnifications up to 50X, the cornea, as an example, appears stereoscopically to have a depth of approximately half an inch and the depth of objects or natural structures can easily be determined.

A new German method of rust-proofing iron and steel uses a spray gun to apply a phosphate solution.

It has been found that ultra-violet rays aggravate the skin eruptions in smallpox.

The apparatus for weighing the earth at the National Bureau of Standards in Washington is so sensitive that an automobile parked outside the building will affect it.

Making Photographs In Color

[*Continued from page* 107]

process your films for you if you wish, and the charges are not high.

Kodachrome is a subtractive process in which colors are obtained by a very complicated mechanism. The amateur, however, is more interested in how to use these materials than in the theory upon which they are based. Kodachrome is available, now, only in 35 mm roll film for Leica, Contax, Retina, Bantam, Argus, and similar cameras. Larger sizes will undoubtedly be on the market before long. Kodachrome must be returned to Eastman for processing, which is included in the price of the film, resembling movie film in this respect.

Individual frames of Kodachrome and Dufaycolor films may be mounted between glass plates and thereby protected against finger prints, dust, etc. In this form it is easy to project them.

Color films are somewhat slower than fast panchromatic black and white materials, Dufaycolor can be exposed correctly using a Weston speed of 8 or a Scheiner rating of 18; Kodachrome will turn out beautifully if a basic exposure of *f*/6.3 and 1/60 second in bright sunlight is used. The following table has been worked out for Kodachrome:

Basic stop on full cloudy day	= *f*/1.9
Basic stop on bright day	= *f*/3.5
Basic stop on hazy sunny day	= *f*/5.6
Basic stop on bright sunny day	= *f*/6.3

Using these stop openings:

1. For light subjects, close diaphragm ½ stop.
2. For dark subjects, open diaphragm ½ stop.
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When taking color photographs, it is wise to remember that what makes the picture beautiful, or worth taking at all, is color. There is no use shooting up expensive film at deep black shadows. The amateur wants color—and at some periods of the year it is surprising how difficult it is to find good outdoor color. The illumination should be flat, that is, the amateur should obey the old formula that says, "stand with your back to the sun." If the foreground is very dark with shadow, it will detract from the beauty of your picture. If a still-life set-up is not fully illumi-

[*Continued on page* 137]

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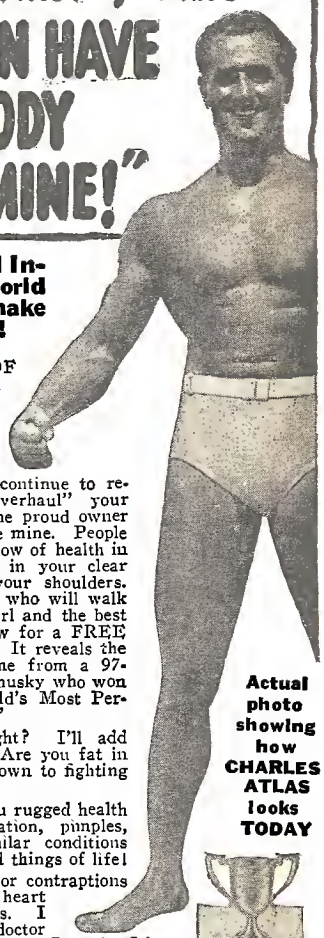

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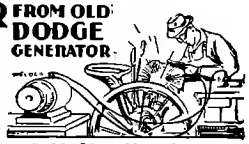

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How To Select A Shotgun

[*Continued from page* 129]

Thus for a waterfowl gun a repeater should have a 28-inch barrel, while a double barrel gun for the same sort of shooting would manage best with 30-inch barrels. So far as an upland gun is concerned, it is a toss-up between the 26-inch and the 28-inch barrels. Many prefer a short barrel in upland shooting, where much hiking is necessary, in that there is just that much less steel to lug around.

There seems to be a disposition on the part of some shotgun users to favor a full pistol grip on their guns. Whatever value they have in a more secure hold on the gun is lost by the fact that one is hindered in handling effectively a two-trigger double-barrel gun. For a gun of this sort, the plain grip is much to be desired, although it is to be admitted that where a single trigger is concerned and there is no need for movement of the hand, the full pistol grip is valuable.

Another introduction of value to the amateur is the use of two ivory beads, one in its usual position near the tip of the muzzle, the other set about 18 inches forward from it on the barrel. While a shotgun is never sighted like a rifle, still in throwing the gun up the eyes instinctively line up along the barrel. The eyes therefore will grasp two beads more easily than just one. At the same time, they will instantly show whether or not you are actually holding the gun straight or shooting to right or left, as the case may be. This will surely be the case if the stock is too thick or too thin, as was previously explained. The use of ivory beads on a gun is very effective when shooting in the shadowed confines of woods, in the half light of morning or late afternoon, and on overcast days.

Some shooters find it difficult to operate the two triggers of the double barrel shotgun, the impulse being to use one trigger and one barrel only, the ability to quickly shift from the one trigger to the other being hard to acquire. In this case some consideration should be given the selection of a one-trigger gun. There are two types, the selective and non-selective. Both are worthy of serious study when making a purchase.

Making Photographs In Color

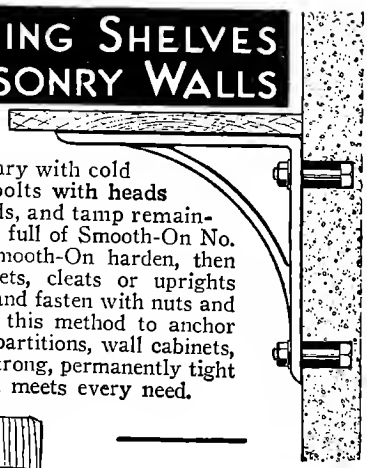
[*Continued from page* 133]

nated, if it has deep dark shadows in it, it will not be so beautiful. The fact is that a dark corner is, by contrast, more attention-getting than the color; and therefore the eye travels away from the color and toward the unsightly black shadow.

Contrast in a picture is obtained by proper placement and usage of color. One will soon become extremely color conscious after making color photographs. He will learn what color combinations are harmonious, and which are bad.

[*Continued on page* 151]

FASTENING SHELVES to MASONRY WALLS



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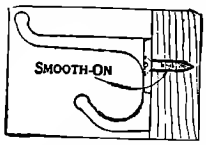
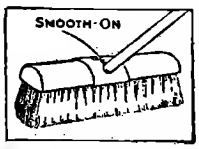


Tightening loose wood screws



Tightening loose handles

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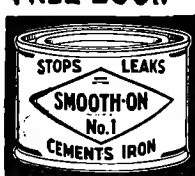

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Crafts And Hobbies

[*Continued from page 71*]

hanging on the wall. Decorate if desired, then bend to shape.

Set a 7-inch length of ⅛-inch brass tubing on end in a sand box, pour full of molten lead and let cool. The bending of the tubing is done in a vise by letting the tubing down into a larger tube, and bending over sharply. This casing helps to hold the smaller tubing round as is illustrated in one of the photographs.

Cut the bottom of the tube open, split it in the center, spread out to make a seat for the candle saucer and drill a 7/16-inch hole in the center. Heat, and run the lead out of one side of the swing. Leave the other side full for balance then adjust the two ends of the swing in the lug holes on the base so that it will swing freely.

Cut out a disk of the sheet brass for the small saucer, and hammer into shape, using the riveting hammer to form a sharp corner at the bottom. Saw off a 1⅛-inch length of 1⅜-inch I. D. (inside diameter) brass tubing, hammer, and solder into the saucer for the cup.

Secure an adjustable candle socket and cut off enough of the slide to bring the piece down to 3 inches high over all. Set this in the cup and clamp down tight with a fixture bushing. Cut off enough of the bottom of the shell so that when it is fitted over the socket it will be of the same height.

Run the wires in through the hollow end of the tubing swing and attach wires to the socket. Wiring in this way does not interfere with the freedom of the swing. Screw in a flame bulb in the socket and the lamp is ready for service by plugging into any outlet.

The lamp may be polished and lacquered, or left in the natural antique brass finish which has been brought out in the process of annealing the pieces.

The dimensions in the details must be followed strictly. A taller candle socket, a heavier light bulb, or a shallower swing will throw the piece off balance so that it will not swing upright.

A Revolving Magazine Rack

[*Continued from page 91*]

shown in Fig. 5. Place a board over the copper when pounding to prevent hammer marks. Fasten copper in place with short escutcheon pins spaced about two inches apart. To facilitate mounting, punch all escutcheon pin holes in the copper before placing it on the box. It is well to polish the strips with steel wool or metal polish and apply a coat of clear lacquer to prevent tarnishing.

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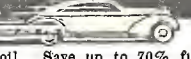

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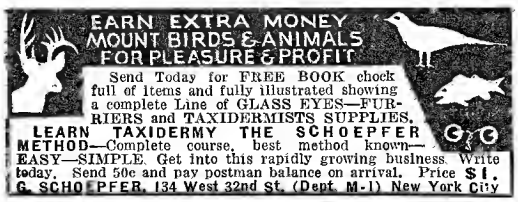

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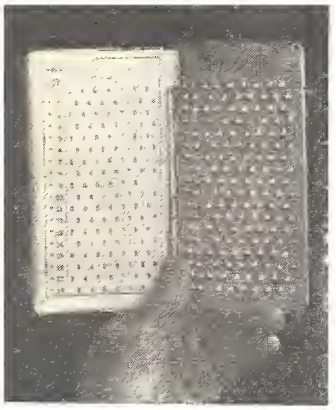
Metal Scoreboard Aids Golfers



A new golf score device (above) consists of a hinged, dished case having pointed conical elevations stamped within. Each elevation coincides with, and is directly under, printed figures on a cardboard scorecard which is inserted in the case. Applying finger pressure over the required number on the scorecard results in a permanent puncture of the number, affording a means of quickly tallying the total score upon completion of the game.

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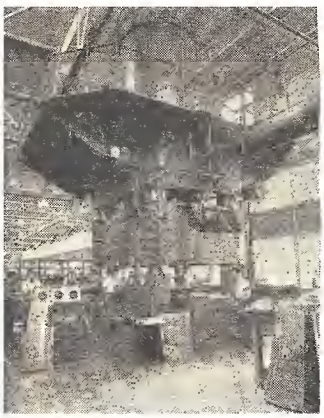

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WELDING

DODGE Arc-Welder. Build your own 40 volts, 25-200 amperes, direct current from old Northeast Dodge 12 volt automobile generators. 120 amperes from one generator, using ⅛ inch electrodes. 200 amperes, $\frac{3}{16}$ electrodes from two generators, etc. Low cost and upkeep. Results guaranteed. Certified Instructive Plans $1.00. COD $1.12. Air mail 12c extra. Welders Club of America, B-3432 Merchandise Mart, Chicago.

SOMETHING NEW—110 Volt Electric Brazing Torch. Produces a 3-inch flame similar to an acetylene welder. Requires no gas or upkeep. Ready to use at the turn of a switch. Will last for years. Complete with all accessories —$12.50. Dept. C, Apollo Mfg. Co., 319 Union Ave., Memphis, Tennessee.

"MAKE Band Saw from old Auto Parts"; "How to make 15-100 ampere A. C. Arc Welder"; "How to build a real lathe". Complete drawings, plans, constructional details, 20c each. All three for 50c. Federal, Box 344, Dept. 23, Indianapolis, Ind.

WIND ELECTRIC PLANTS

BUILD wind light plant. We show you how. Complete plans and valuable catalog 10c. Wind plant parts, welders, electric fences. LeJay Mfg., 414 Lake, Minneapolis, Minn.

GENERATOR Propellers, expertly designed at factory prices. Universal Aircraft Co., Fort Worth, Texas.

Guardians Of The Sea

[Continued from page 50]

That this service is worthwhile is shown by the fact that not a single life or vessel has been lost because of bergs since the patrol started. The expense of this service is shared by the nations whose ships benefit by the work. Each country pays its part according to the number of vessels it has in the affected area.

To maintain the slogan "Always Ready," Coast Guardsmen undergo countless hours or rigorous training and drilling. Every day of the year, Coast Guard vessels are patrolling our coasts. Other vessels are in port prepared for tasks necessary to protect life and property afloat.

To get first-hand knowledge of how this important branch of the service goes about its daily routine, the writer obtained permission to accompany the Coast Guard Cutter *Champlain* on one of its regular patrols.

Measuring 250 feet long, with a forty-five foot beam and a sixteen-foot draft, the *Champlain* carried approximately 100 men, commanded by Lieutenant Philip A. Short. A five-inch gun is mounted forward and a similar gun is mounted aft. Two six-pounders also are mounted forward. Usually stationed in the New York Division, the *Champlain* each spring takes part in the International Ice Patrol.

Soon after the ship left the harbor, the "Call to Stations" order was given. Before going aboard ship we had wondered what kept officers and crew busy all day. The first afternoon out we found that we had not counted on the never-ending drills.

After "Call to Stations," the fire drill signal was sounded. In what seemed to be but an instant, streams of water fed by high-pressure pumps were shooting from several nozzles.

The signal for "Collision Drill" quickly followed. A large mat approximately eight feet square was brought out on deck to a point near where a hole was supposed to have resulted from a mythical collision. Ropes were fastened to each corner of the mat, and two of them were passed under the ship and up on deck at the other side. The mat was lowered quickly to a position necessary for covering the "hole."

Activity aboard ship is continuous throughout the twenty-four hours of the day, and therefore one does not recognize any marked distinction between the hours of daylight and darkness. Three

[Continued on page 153]

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordania, North Borneo, Manchukuo, Sudan, Macao, Iraq, Charkhari, French and British Colonies, including natives, beasts, ships, etc., all for 5c to approval applicants. Big illustrated lists included. Kent Stamp Company, Box 87-Z (G. P. O.), Brooklyn, N. Y.

BHOPAL—India's Only Triangle! Beautiful, giant, bicolored; now obsolete! With Colossal Tru-Value Packet, including thirty attractive pictorials, Commemoratives, Airmails—10c, with Double Premium Approvals. Inquire regarding Free Airmail Collection. Tru-Value Stamps, Box M1412, Hartford (1). Connecticut.

STAMP CATALOGUE FREE — Special Gift Edition—Giant forty-page quarterly listing Albums, Supplies, Coronations, British Colonials, Canadians, United States, sets and Airmails. Illustrations galore! Empire Stampco., Dept. MM., Toronto, Canada.

LIBERIA Jubilee Set—Complete! Beautiful bicolored landscape commemoratives, cataloging 30c, Plus thirty attractive pictorials—10c with low-priced approvals. Economy-stamps, Box M1543, Hartford (5), Connecticut.

UNITED STATES Approvals Only. Send post card for selection of U. S. Stamps on approval: 19th Century, Commemoratives, Air Mails, Revenues. John C. Daub, Dept. A, Wabash Bldg., Pittsburgh, Pa.

DIAMOND Airpost Commemorative Issue Complete, Proletariat Portraits Complete, Dragon Stamp, with 117 additional, cataloging $3.00, only 10c. Friendly Filatelists, Box 4428M, Philadelphia, Penna.

LARGE Spanish ship stamp, Azerbeijan Cameroons, Chad, Dahomey, Gabon, Ubang in packet of 57 stamps. All for 5 cts. with approvals. Swedell, 3129 Garfield Ave., Minneapolis, Minn.

THREE Costa Rica Diamond Mint Air Mail, 100 different foreign from many countries, one dime to applicants for our foreign approvals. Globe Packet, Westwood, New Jersey.

FREE—Rare Diamond Shaped Airmails provided you purchase at least 25c from our double premium approvals. Progress Stamp Service, Kirkland, Washington.

GIGANTIC Bhopal Triangle, Turks Caicos, $5 U. S., Caymans, genuine Baden. Everything 3c with approvals. Viking, 1MM Hanson Place, Brooklyn, N. Y.

CORONATIONS—mint and used, including Tru-Value Packet—thirty attractive pictorials, including giant bicolored Liberia bird and animal new triangle—10c, with Double Premium Approvals. Inquire regarding Free Airmail Collection. Tru-Value Stamps, Box M1412, Hartford (2), Connecticut.

MONTHLY Stamp Magazine, 6 months and 25 foreign stamps, 25c. American Stamp Journal, Cedar Rapids, Iowa.

UNITED STATES—45 different 10c. Free 25 different with approvals. Enclose 3c. Sidenburg, Baroda, Mich.

JUBILEES! 10 different used 10c. Specialty Import Service, 2308 Harvey, Berwyn, Ill.

FREE!!! Coronation Set. Postage 3c. Roberts, 901T Fourth, Baycity, Michigan.

COINS

$5.00 TO $500.00 EACH paid for Old Coins. Keep all old money. Get posted. Send 10 cents for Illustrated Coin Value Book, 4x6. Guaranteed Buying and Selling Prices. Coin Exchange, Box 17, Le Roy, N. Y.

COINS, Beadwork, Indian Relics, Minerals, Books, Curios, Stamps. Catalogue, 5c. Indian Museum, Northbranch, Kansas.

CALIFORNIA gold quarter size 27c. $½ size 53c. Large Illustrated Catalogue 10c. Norman Shultz, Salt Lake, Utah.

INDIAN CURIOS

INDIAN CURIOS. 100 good ancient Arrowheads $3.00. Tomahawk Head 50c. Illustrated catalog 5c. H. Daniel, Hot Springs, Arkansas.

INDIAN RELICS

12 ARROWHEAD, Spearhead, Wampum, Gempoint 99c—20,000 Bargains, Photolist 10c. Museum, Rutland, Illinois.

ANTIQUE FIREARMS

BLUNDERBUSSES, Matchlocks, Flintlocks, Dueling Pistols. 87 Bargains. Photolist 10c. Museum, Rutland, Illinois.

OUR SENSATIONAL NEW 1938 CATALOG NOW READY! NEARLY 600 PAGES OF UNUSUAL NOVELTIES, SEND 3c FOR IT!

BROADCAST thru your radio TALK - SING - PLAY

BROADCAST your voice on programs coming through your own radio set—make announcements from any part of the house—imitate other artists, jest and mystify friends. Imitate radio stars, practice crooning, singing, radio acting, etc. Do a "Men Hernie" or a "Rudy Valee."

World Mike

Made especially for home use, attached in a jiffy without tools. Not a toy. Put on your own programs at home, parties, club affairs, etc. Barrels of fun! Easy to operate.

Price Postpaid 25¢

DELUXE MIKE

Large, substantial, all-metal mike. Practice talking, broadcasting, singing, announcing, etc. Has two heavy cadmium Heydoodes to hold in hand. Cord 6 feet long with plug attached. Price, $1.00

Telegraph Set

A Private Electric Telegraph set for only 15¢! Use it as a practice set or send messages to friends. Consisting of a key, sounder, battery, tacks, wire, code and instruction book. Book on Electricity only 10¢ for 64 interesting pages. Tells how to make wireless, telephone, telegraph sets, etc. Price 10¢.

15¢

HANDS UP!

Cigaret Pistol

Looks like a dangerous automatic, but shoots cigarettes! Lots of fun for you and your friends. Handsome nickel finish, extremely life like. Price, 25¢

Pea Shooter

Peanuts automatic pea shooter holds a dozen peanuts. Operates fairly accurately and puts out the peanut with terrific force. Also shoots hollowed bean blow-gun and lead pellets. Powerful. Price 25¢ holster. Only 10¢ extra.

Cap Pistol

A snappy automatic cap pistol patterned after the famous Colt .45 Army Model. Uses any standard caps. Fires 50 shots without reloading. Looks and feels like the finish Appearance 35¢ years burglars.

Air Pistol

High powered, accurate air pistol. Fires 6 shots from single loading. Shoots BB shot, darts or pellets. Shoots up to 100 yards. Price, $2.50, 100 shot, $5.00

ALL WAVE WORLD WIDE RADIOS

Remarkable results—simple operation—low price! $5 to 800 meters, gets police calls, German stations anywhere, code, short wave, foreign and domestic broadcasts, etc. with remarkable volume and efficiency. Small enough to carry in hand, yet strong enough for home use. Tubes furnished. Tube Set, $1.55. Tube volume, $2.00. Super Wireless, $2.30. Super Wireless Battery Set $2.75. Gives better volume & clearer tone. Tubes furnished. Crystal Set, $2.00. Wireless crystal receiver, $2.75. ELECTRIC WIRELESS, $3.00. Gives better results in more current. Uses no batteries. Tubes furnished. Note these prices! Wired, ready to operate, $3.75

MIDGET POCKET RADIO $1.00

Listen to Music Programs and Sports Everywhere You Go—Loud Tone

Good reception with beautiful clear tone! The amazing midget pocket radio gives you all the entertainment of a radio wherever you may be in the country. Tunes office, etc. etc. **ANYWHERE**. **EVERYWHERE**. Receives practically all broadcasting stations. Entirely self-contained. Nothing else to buy. Has sensitive crystal detector and high efficiency detector. Extremely life like. Tunes regular Aerial. Price Postpaid $1.00. Extension Aerial, 39c. Phone & Radio Set $1.79.

CRYSTAL RADIO 25c

Be sure to get reception with it alone when the set-commander resists station for up to 100 miles. Loud enough for phones. All you need is a pencil for tuning. Wonderful for amateur radio study. Complete with headset, aerial wire, crystal, sound-tone, variable condenser, etc. Instructions for building Solar Receiver by using crystal. Reception guaranteed. 25c

Pocket Telescope

Eagle-Eye Vision Six Power **25c**

Big, 3 draw, 6 inch, perfect telescope for only 25c! Swell for outdoor events, study, sports, looking at the moon. Convenient size for pocket or hanging on belt. Has sensational Solar Eyepiece by using smoked glass as you can see sun spots. etc. 25c

Moving Picture Projector

A real Electric Movie Machine for only 39c! Shows pictures, movies, etc. on screen 12 inches in size. Just insert the film, turn the crank and you see moving pictures as on the movies! Uses 2 flashlight cells obtainable anywhere. Strong Red and Green Lenses. Complete with 5x5x3 inches. Complete with bulb, screen to view pictures. Price 39c. Film of choice of Polar the Cat, Flying Mail, Bull & Calf, Farm Mike, etc. 15c each.

Wireless Transmitter Broadcasting Set

First again! First with the improved crystal radio, then the famous Wireless, then the All Wave World Wide Radios, then the Dollar Pocket Radio, and **NOW** a genuine RADIO TRANSMITTER that sends out messages by wireless, for only $1.00, plus 10c postage. Note these sensational features:

- ★ **Can be picked up on a suitable Radio Receiver**
- ★ **Not a Mike, but a complete Broadcasting Set**
- ★ **Complete with Key, in Kit Form**
- ★ **Plugs in to any AC-DC circuit**
- ★ **Uses 2 oscillating tubes**

Complete Transmitter, $1.00 plus 10c post. Tubes (uses 2) Each 50c

WONDERFUL X-RAY 10c

GREAT CURIOSITY! With it you can pleasantly see the bones of the hand, coin in pocket, even the flesh seems transparent. Always creates interest. Only 10c, 3 for 25c

Silent Defender Throat knuckles! Made of aluminum; fit pocket. Wt. 2 oz. 25c. Price

HOW TO BUILD A MIDGET RACER from junk yard parts for a few dollars. Complete blueprints, plans, diagrams, etc. Price 25c

FIELD GLASSES 25c

What a bargain! Real genuine Field Glasses with powerful lenses, inner parts, sun shades, etc. Permits full, unhampered eyesight. Eyes wear out without use. Strengthen eyes with field glasses. Compact with cord. Packed in box. Only 25c

How To Be A Police Reporter

Secret system! Any author make money by revealing news. Don't miss this marvelous, thrilling. Only 25c

MIDGET RACER

Complete blueprints for 3 different racers. The one illustrated can be built for a few dollars. All about racer construction, designs, etc. Includes track racing rules, blueprints. Shows how to make your own increasing speed, etc. etc. Cremates a James Bond full of information and plans & blueprints

25c

Over 75 illustrations, plans & blueprints COMPLETE BOOK only 25c

YACHT CAPS

Smart, snappy. Just what every real boy is wearing. Cool and comfortable. White Yacht Yacht Cap, with black oilcloth peak, sweat band, gold braid and brass buttons **25c**. White Yacht Cap, superior quality, white oilcloth peak, gold braid and brass buttons and red, white and blue anchor on front. Size 6 7/8 to 7 1/2. Price each **35c**

Cigarette Stinkers

Sensational new joke! Can be offered to any cigarette so that the person who takes the cigarette from the package will get a nasty surprise. Looks like a regular cigarette. Only 10c. Joke for smokers.

LEARN to HYPNOTIZE

Make People Do as you wish. Control their will! This amazing book teaches you the science of hypnotism and electricity. Learn how to entertain them. Be the master of any situation. Price 25c

Radio & Television Book

How to build modern five crystal set, short wave radio, short wave converter, television set. With illustrations so you can understand. Price 10c

Quartermaster - Navy - CCC - Marine - Army - Aviation

Handsomely engraved emblem rings made to resemble rings worn by men in U.S. Government service. Jumbo size, accurate detail, will fit any finger. Impressive ornament. American Eagle, Anchor, Globe and Ring, designs. **SILVER APPEARANCE** **25c**

Sterling Silver $1.00. 14 kt. Gold Plate $1.75.

Photo Ring

Sensational new invention! Develops and prints your own pictures. Holds any picture, good luck. Brilliant finish. Looks like finest jewelry. Only 25c

Skull & Crossbones

Designed enameled Personal initials, lucky finish. Brilliant finish. Looks like finest jewelry. Only 25c

for Silver finish **35c** ring. Price **25c**

Kinner Sportster

Popular flying model. Easily built. Has accurate model of real plane. Complete with wheels, propeller, rubber motor, cement, model airplane dope, etc. Price Only.... **12c**

Stinson Reliant FLYING MODEL

Jumbo 24" wing spread and correct model of the famous plane. Flies like an airplane. Takes the bumps. Latest type construction. Complete to Kit. **25c**

Hawker Fighter AIRPLANE KITS

Cowy of England's famous fighting plane. Climbs and flies like an airplane. Flies with maximum speed. Complete. Price Only **25c**

High Climber r.o.g.

Standard control single duration model. Flies consistently for 5 minutes. Climbs 100 feet. Strong, sturdy and easy to fly. Complete with 12" propeller. Price Only **25c**

FUN LICENSES 10c

Marriage Certificate, Liar & Booster Cer., Goodness Certificate, Sonship Athletics Cert., Gold Digger Cer. Price 10c each license

Cowboy Lasso

Specially made lariat for performing tricks alone and after. Large animals, as dogs, calves, etc. Climb up and down. Use rope to prevent sliding, and swivel prevents twisting. Complete **35c**. Free Contest Rules. **RO-LO LASSO** Performer, Rope trick without practice. Needs only 2 feet. Swivel and Rules. Contest Rules Curls. Throwing Thru Loop 12c. Hours of practice. Only

WHOOPEE CUSHION

Prankster Cushion is made of rubber, inflated takes but one breath, and then placed on a chair. Pause a minute, etc. When the victim unsuspectingly sits upon the cushion, it gives forth noises that can be better imagined than described. Price **25c**

JOY BUZZER 28c

Funniest novelty ever invented! Fits the inside of the hand. Cannot be seen in the hand. Looks like a clockwork mechanism but is electric. When touched, the mechanism creeps around your hand. Every time you shake hands, your friend will get a terrific shock. Touch them on the back, and watch them jump. Then say nothing. They'll be off on it. Under a sheet is feels like a mouse. Use in the mail, window. Hundreds of uses. ONLY **28c**

ELECTRIC MOTOR 15c

An Electric Motor for 15c. Sounds almost unbelievable but it is perfectly true. We send all the parts needed to make a motor, with full instructions for assembling, operating, etc. Putting it together—it's FUN.

15c

D. C. or A.C. Just six speeds: Runs on a No. 6 or 8 dry cell battery. Educational—not a toy. Experimental. Price 15c. Big catalog 10c.

CIGAR LIGHTERS

Four unique lighters at the low price of 15c each. Full sized Pens—Bullets, Bullets and one which looks like a Cigarette. Will fit in your cigarette case. Lighters easy to operate. Your choice ONLY

15c

Flints 2—10c

Telegraph Set

A Private Electric Telegraph set for only 15¢! Use it as a practice set or send messages to friends. Consisting of a key, sounder, battery, tacks, wire, code and instruction book. Book on Electricity only 10¢ for 64 interesting pages. Tells how to make wireless, telephone, telegraph sets, etc. Price 10¢.

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A snappy automatic cap pistol patterned after the famous Colt .45 Army Model. Uses any standard caps. Fires 50 shots without reloading. Looks and feels like the finish Appearance **35c** years burglars.

Air Pistol

High powered, accurate air pistol. Fires 6 shots from single loading. Shoots BB shot, darts or pellets. Shoots up to 100 yards. Price, $2.50, 100 shot, $5.00

BLANK CARTRIDGE PISTOL 50c

REVOLVER STYLE

$1.00

Two models now on sale at $1. Well made revolver. Latest type of blank cartridge pistol. Looks like regular pistol. Blank Cartridges obtainable everywhere. Not an explosive nor a firearm. Contains no bullets. Have a tremendous report. Excellent for Fourth of July, New Years Eve and Celebrating Events, etc. Two Sizes. Medium size 50c. **$1.00**. Blank Cartridges 25c Box (100 to a box) 50c. Holster (Cowboy type) 50c. Shipped Express Collect.

JU-JITSU DON'T BE BULLIED

The Japanese art of self-defense. New methods of attack and defense are illustrated. In no time you can learn it. Don't understand them. Deals fully with trips, throws, holds, locks, body holds, defense against revolvers, daggers, umbrellas, scissors, spills, headlocks, holding a man down, double knee throw, arm attack, defense against knife, one hand throat grip, defense against two assailants, stomach throw, several chokes, several throws, several pinches, and numerous others. Learn to unlock yourself under all circumstances with ease. Only 25c.

BOOK OF BULLETS

30c

Illustrated with actual photographs. Shows how to make your own bullets. Complete blueprints for 3 different types of bullets. Only 30c.

Pocket Telescope

Eagle-Eye Vision Six Power **25c**

Big, 3 draw, 6 inch, perfect telescope for only 25c! Swell for outdoor events, study, sports, looking at the moon. Convenient size for pocket or hanging on belt. Has sensational Solar Eyepiece by using smoked glass as you can see sun spots. etc. 25c

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Four unique lighters at the low price of 15c each. Full sized Pens—Bullets, Bullets and one which looks like a Cigarette. Will fit in your cigarette case. Lighters easy to operate. Your choice ONLY

15c

Flints 2—10c

CHAMELEON 25c

ALIVE PET

WATCH IT CHANGE COLOR!

Get one of these most wonderful of all creatures. Watch it change color! Study its habits. Never one will be found of two colors alike. Shoots out its tongue to catch flies and insects for food. Can be kept in a box in your room for months without food. About 3 in. long. Shipped to you by mail. Directions for keeping sent. Guarantee safe arrival and live delivery. Only 25c

THRIFT VAULT

A 3 dial safe lock and Vault Bank. That dial the three numbers and open the vault. Looks like a safe. Big and ornamental, measures about 4x3 in. Has a key hole for depositing money, jewelry, etc. in. Completely enclosed in black trimmings. Full instructions with each bank. VAULT BANK only 50c postpaid.

THRIFT VAULT SAFE Similar to above only made of steel, and slightly larger. Packed in a box with complete directions for opening. Price, ppd

$1.25

INSERT A COIN AND OUT COMES A DELICIOUS CHOCOLATE BAR

Thrift Bank and Slot Machine

FREE! to have and to hold—without any cost, except think of having this handy bank around and as a penny, nickel or dime is dropped in—out comes a chocolate bar, all wrapped and ready to eat. Simple, isn't it? and you'll find that it fills up with money while you're gone.

HOW TO GET YOUR BANK FREE!

This slot-machine bank cannot be bought. There is just one way to get it—and that is by getting lots and lots of customers. Our big, new, 1938 Catalog will interest them. Made of sheet metal with regular locked door so you can open, remove money and refill with chocolates. Can be used for candy, too, and is a flashy, winning shooting bank. Red, yellow and green. Send a dollar bill ($1.00) for the 10 bars and get the bank **FREE.**

EXTRA! 1938 Gift-page novelty catalog, 3500 illustrations.

COMPLETE CAMERA OUTFIT

35c

Although this outfit cannot absolutely compete with more elaborate and expensive cameras, it does take pictures 2 inches square. Good lens and shutter. Complete with 6 exposures, and a supply of chemicals for developing and printing. Also contains a packet of printing paper. Complete instructions so plainly given, no one should have any difficulty. Full printed instructions to plainly

Camera and complete outfit for only 35c with 6 exposures. Additional rolls, 10c each. Extra printing paper 10c per package of five films. Extra printing paper 10c per package.

Open Any Lock

Did you ever lose or forget your keys? Probably many times. Don't worry any more about keys, or spend money for that matter, as these master keys will open most any padlock. Set contains 5 different keys for various types of locks. Will save their cost many times by use them once. Get you'll make a real saving. Be sure that you have the correct key.

5 MASTER KEYS Price 25c

BOYS! BOYS! BOYS!

THROW YOUR VOICE!

Have fun fooling friends. Make it appear your voice comes from a distance, in the mouth of a doll, under the table, in the next room, etc. Amuse and entertain your friends. Complete course on Ventriloquism taught in eight lessons. Everything necessary. Small bottle, 25c. Medium size bottle, 50c. Large size, $1.00.

VENTRILO

LUMINOUS PAINT

LUMINOUS PAINT, when applied to an object, emits rays of white light, rendering it visible in the darkest night. Gives off light—the brighter it shines. Simple to use—just paint it on. Apply a coat to the dial of your watch so you can tell time at night. Paint outlines on doors, windows, fences, etc. Experiment with it. Small bottle, 25c. Medium size bottle, 50c. Large size, $1.00.

Midget Bible Size of a 25c piece, 1 1/2 x 2 inches, over 200 pages. Every word legible. New Testament. Send in 10c for it. Also Bible in Leather cover, gold edges, 50c.

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Build A Model Ocean Airliner

[*Continued from page* 126]

them to the wing. These are made of bamboo strips of 7/8 and 15/16 inch lengths, respectively, cemented to the floats but not attached to the wing until the ship has been painted. Other details such as radio mast, directional radio loop, and aerial must not be put on the plane until it has been painted and ready for a coat of clear lacquer.

Once the cemented parts of the model have dried, and the air scoops have been glued beneath each cowling, proceed to paint the model. With the exception of the red bottom on the hull and the wing floats, the model is painted silver. After the first coat has been applied attach the wing floats in position. Several additional coats of paint are then applied, making certain that the ship has been sandpapered between coats. After applying the fourth coat, the windows, lettering and engine discs are cut from black paper and glued to the model. Builders will find that mucilage must be used in this operation as ambroid will dissolve the paint and ruin the finish.

Radio mast and directional loop are bent from soft wire. These and other details may now be placed on the model.

Control surfaces such as the ailerons and rudder are indicated by thin black lines. These may be drawn with India ink, using a ruling pen and a triangle as aids. India ink is also used when drawing in the engine cooling flaps on the cowlings.

After all the details have been added and the paint completely dry, finish the model with a coat of clear lacquer. Ready-made metal propellers are added to the ship with pins, and with the drying of the lacquer an authentic model of Britain's history-making sky liner will result.

Making Photographs In Color

[*Continued from page* 137]

Dufaycolor is processed as follows: The film is first developed in a metol-hydroquinone formula supplied by the manufacturer. Then this developed film is bleached; exposed to light; developed again to reduce the remaining silver, and then it is fixed.

Prints can be made from both Kodachrome and Dufaycolor. The amateur can do it, but it is a long, complex process and full of difficulty. Furthermore, it is very expensive. Current prices for prints are about $10 for a full color print 8 x 10 inches, and less, of course, for small sizes. It is a fact, however, that size lends a great deal to color. It is for this reason that the projected images are so beautiful. A small color print is not much more beautiful than a black and white—but an 8 x 10 gains depth tremendously and makes one very much dissatisfied with black and white photography.

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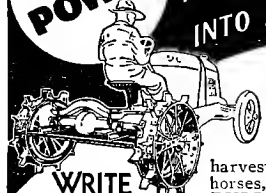

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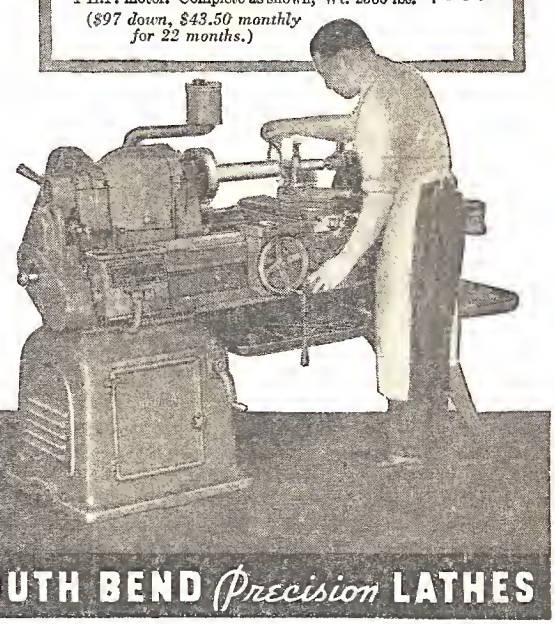

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SOUTH BEND *Precision* LATHES

Guardians Of The Sea

[*Continued from page* 149]

o'clock in the morning finds just as much activity in some parts of the vessel as at three o'clock in the afternoon.

While we were in Chesapeake Bay we received an SOS from the *Sangate Castle,* 785 miles east of Chesapeake Lightship. Although we did not start for her because other ships close by were on their way, we were astounded at the speed with which a distress call is handled.

When an SOS is sent out, probably in no other place does it receive such prompt attention as from the Coast Guard. The radio operator on watch presses a button which sounds an alarm in the radio men's quarters. One operator rushes to the radio shack and assists the operator on watch. Another operator goes to the bridge and operates the direction finder. Within less time than it takes to describe it, he has turned on the receiver, tuned in the station sending out the SOS, and has obtained a bearing on the helpless vessel. In the meantime a messenger has notified the officer of the deck that a distress call has been received. Within a minute, the Coast Guard is ready to proceed to the rescue.

That no SOS will go unheeded, a twenty-four hour watch is maintained on the international distress, 500 kilocycles, and the Coast Guard calling frequency on short waves. One operator listens in at all times on both frequencies. This is accomplished by the "split phone" method. Wearing a standard headset consisting of two phones, the operator has one connected to a receiver tuned to the international distress frequency, and the other to a set tuned to the Coast Guard calling frequency.

To facilitate getting under way immediately after an SOS is received, steam at operating pressure is maintained at all times. Turbines are turning over and all that is required for full speed ahead is the placing of the throttle at the correct position.

Because most SOS calls are received in stormy weather, Coast Guard vessels must be capable of operating in the heaviest seas. A hurricane may have disabled a large freighter and she is in danger of going down unless help arrives soon. If the message is received by the Coast Guard, the captain of the disabled vessel may be sure that assistance is on the way.

Last fall, during a trip down the coast in a hurricane, the *Champlain* leaned fifty-four degrees to starboard. The reader who finds this surprising will be even more surprised to know that she could have leaned considerably more. Even if she had leaned until the top of her 135-foot mast was in the water, she would have come back just as surely as she did from fifty-four degrees. Because Coast Guard vessels can take it and Coast Guardsmen can take those vessels where they are needed, the sea is not quite as dangerous as it would be without them.

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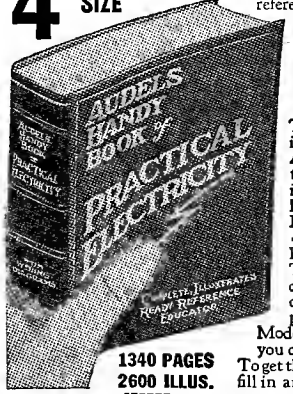

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A water circulator which speeds up circulation in hot water heating systems in winter.

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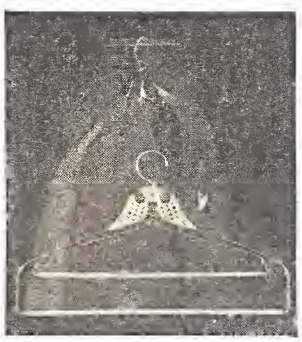

This space-saving coat hanger is so constructed that two garments may be hung from it at same time.

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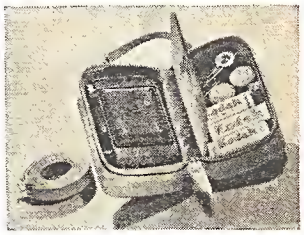
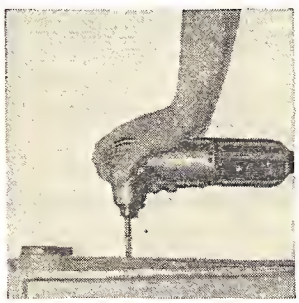


This sturdy book-style case will carry a camera and any small supplies. Accessories cannot fall out.

A hydromatic gun which opens clogged pipes, toilets, sinks floor or roof drains, drinking fountains, gas lines, oil lines, water pipes and supply pipes. Portable and hand operated, it can be used by anyone.



This light-weight drill combines ample power with ability to work around corners. Fits hand snugly.

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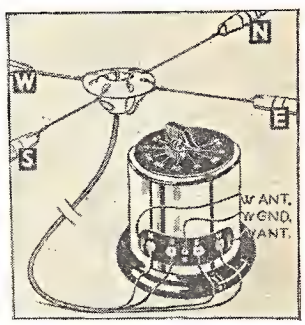

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RADIUM From The Arctic

by James Montagnes

Since 1931 the mining camp at Great Bear Lake has grown from the few buildings shown above to a substantial community with a bank, stores, etc. The piled-up drums contain fuel for prospectors' planes, main transportation means.

On the shore of Great Bear Lake near the Arctic Circle, a load of pitchblende (right), the ore that contains radium, awaits shipment by plane and train to the refinery at Port Hope, Ontario, more than 3,000 miles away, where the mineral is chemically extracted from the ore in batteries of retorts (above). It requires 20 tons of chemicals and 6½ tons of pitchblende to yield one gram of radium valued at $70,000!

Frozen, at free of ice, Great Bear Lake (above) provides an excellent landing area for the planes of prospectors who work the valuable radium ore claims.

Left—Chemical extraction of the first ounce of radium from Great Bear Lake ore is eagerly watched by Gilbert LaBine (extreme left), discoverer of the mines, and a group of friends. Above—"Cooking" pitchblende with chemicals to extract radium used in cancer treatments.

Stirring acids into pitchblende to start radium extracting process (above). Note the rubber gloves worn by the laboratory workers to avoid burns.

WHEN prospector Gilbert LaBine flew over Great Bear Lake in northern Canada and saw strange dark seams in the rocky shore just below the Arctic Circle, he little realized that six years later he would produce the first ounce of North American mined radium, that his aerial view of rocky Great Bear Lake coast meant the breaking of the Belgian Congo radium monopoly with a resultant cutting of price from $2,000,000 an ounce to $840,000.

Today on the shores of remote Great Bear Lake there are many mining camps, some already in production, others in initial stages, and farther afield prospectors are still staking claims. A rush followed LaBine's discovery in 1930. He went in by plane and dog team during the spring to explore the dark seams he had seen from the air. He battled the last of the Arctic blizzards, crossed treacherous spring ice on the 12,000 square mile lake, and made for the bay where he had seen the peculiar rock markings. There he found pitchblende, the ore which contains radium and its associated minerals, as well as silver, copper and some gold. But other metals were forgotten in the possibilities of radium, the little known mineral which sells by the gram, 28 grams making an ounce, the mineral which has been found to be one of the most likely cures for cancer, one of the scarcest and most valuable minerals on earth.

The assays proved the pitchblende was rich in radium, and extremely rich in silver. LaBine, his brother, and several other prospectors staked five miles of Great Bear Lake shore. Their vein ran nearly all the way. And though they were a thousand miles from the nearest railway, though water transportation did not exist, though only planes or dog teams could get in, LaBine and his brother financed their find, started a rush.

They shipped out bags of the black ore, dangerous to handle because of the radium content. By plane, by tractor and by scow, they hauled mining machinery from the nearest railway—more than one thousand miles away. At Port Hope, Ontario, they established a refinery and procured the best man available to extract the radium from the ore, Marcel Pochon, who had done work for the Canadian government's research laboratories. And while they tunneled on Great

[*Continued on page* 120]

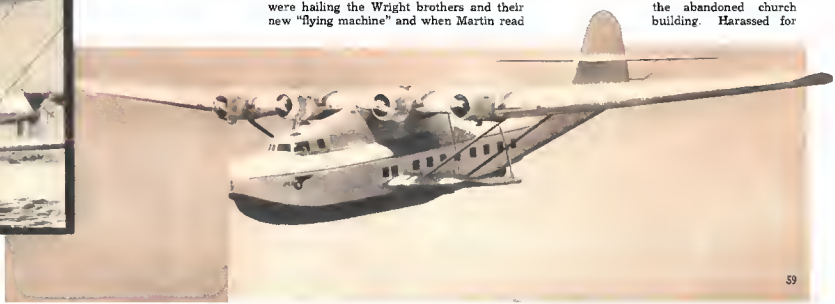
Martin—

"Early Bird" of Aviation

by Robert H. Rankin

A self-taught designer-pilot whose planes have made history.

Glenn L. Martin, shown examining a model of his famous "China Clipper," was one of the first American pilots awarded an international license issued by the Federation Aeronautique Internationale, and is credited with being the third man in the world to build and successfully fly an airplane of his own design. An early Martin single-float seaplane is shown above. Contrast its size and construction with the world-famous, 130-foot span Martin "China Clipper" shown at right.



THE name of Glenn L. Martin is one of the oldest, as well as one of the best known in the entire field of aviation, having been associated with aeronautics since the days of the "Early Bird" pioneers who followed fast in the footsteps of the Wright brothers. His bombing planes, with their high speed and wide cruising range, revolutionized theories of aerial bombardment, and his big "Clipper" flying boats have demonstrated the practicability of air transportation over the Pacific.

As a lad in Salina, Kansas, he evidenced a marked interest in mechanics and won a reputation for being able to repair anything from a bicycle to a threshing machine. A great reader, he eagerly followed the accounts of the glider experiments of Chanute and Lilienthal. Experimenting first with large kites, then with gliders, Martin dreamed of the day when he would fly a powered craft.

In the meantime, he completed his public school education and went to Kansas Wesleyan College, where he studied for two years. His parents then moved from Salina to Santa Ana, California, and Glenn joined them, obtaining employment as a garage mechanic in his new home town.

At this time the newspapers of the country were hailing the Wright brothers and their new "flying machine" and when Martin read of their success he decided that he would build a machine of his own. He hired an abandoned church to build it in and worked on the craft daily. Mrs. Martin had the greatest faith in her son and when it became too dark for him to see she would hold a lighted kerosene lamp for him so that he might continue his building far into the night.

After much hard work and an abundance of discouragement and criticism from fellow citizens, Martin finally completed his plane in 1909. Wheeling it out into the California sunshine, he was determined that he would make it fly or die in the attempt. He took his place at the controls and the propeller was spun by an obliging, if somewhat skeptical spectator. The coughing, spluttering 14 h.p. second-hand engine came to life and as the propeller bit into the air, the craft moved forward. Gaining speed rapidly, it lifted into the air and Martin became the third man in the world to build and successfully fly a heavier-than-air craft of his own invention and construction.

At once, he decided to enter the airplane manufacturing business and gathering seven ex-automobile mechanics about him, he established his factory in the abandoned church building. Harassed for

The WHITE HOUSE Talks to the WORLD

"National 1414" holds first place among U. S. telephone subscribers.

The White House must be capable of immediate contact with principal capitals of the world. A gigantic network of phones meets this important communication requirement.

When the President wants to talk to a ship at sea, this operator connects the call to the desired vessel. The equipment is located at the Deal Beach, N. J., station of the Bell Telephone Laboratories.

by James Nevin Miller

WHAT might properly be called the "number one" telephone in the nation is listed in the Washington phone book as National 1414. This is the official home of Franklin D. Roosevelt. Better served is he by telephone than any other person in the world. Better by far than any President we've ever had.

At any moment, day or night, Mr. Roosevelt can select any one of 150 phones and talk with friends, official emissaries of our government, in fact, anybody in almost any nation in the world. Sixty different countries are now linked by telephone service. These countries have an aggregate of over thirty million telephones, according to official estimates, of which some eighteen million are on the North American continent and over ten million in Europe.

These figures seem rather bewildering when you realize that the White House staff and its equipment are exceedingly small. There are only five operators, all of them men except one, and a single switchboard. But it's a dandy—a three section PBX or private branch exchange. Usually three operators are on the job at one time. They work in shifts.

The switchboard is located in the new executive offices on West Executive Avenue on the second or top floor. Mr. Roosevelt's private office is close by—on the first floor.

Through this board the Chief Executive and his office force have direct communication with all major government departments and the Capitol. There are also a good many private lines leading to the homes of close personal friends and administration advisers. The official residence has telephones in the study and most other rooms, including the head usher's office at the private entrance.

President Roosevelt in his study at the White House with his everready telephone beside him. Above—Louise Hachmeister, nation's "number one" telephone operator. She is the only woman operator in Executive Mansion. Unlike some of his predecessors, President Roosevelt makes good use of the telephone. President Wilson disliked the service and would not permit the operator to ring his phone.

At first thought you naturally wonder why so many phones are utilized in the White House. But the reason is obvious enough. In his work the President probably has more responsibilities than any other business executive in the world. The entire functioning of our government, except of Congress, is under his control. So he must be immediately available every minute of every day in the year.

Operating the White House switchboard is a young woman whose ability to maneuver its cords and keys and use her head at the same time brought her to the personal attention of President Roosevelt and others in high command.

She is Louise Hachmeister, a dark-haired, square-jawed, smiling, super-operator who

Talking over seas today is a very simple matter for the White House. Here is shown the receiving antenna array used for trans-ocean communication. It is the short-wave radio telephone receiving center of the American Telephone and Telegraph Company, at Netcong, N. J. It is the portal of speech for some sixty countries.

Make This Picturesque Christmas Tree Base

by
F. Leland Elam

Constructed of scrap lumber, burlap and plaster of Paris, this rustic base will enhance any Christmas tree. Left—Forming framework of the base involves only the use of a hammer and a saw.

After completing the lath frame of the base, arrange a large piece of burlap over it to determine the location of holes for two tunnel openings.

AN ARTISTIC base for a Christmas tree will add greatly to its beauty, and to the enjoyment of the tree which exemplifies the Yuletide in nearly every American home. Such a base, resembling snow covered mountains, can be made in a short time at little cost.

The stand can be made to any size desired. It need not be made of planed lumber; scraps can be used. A base 3 feet square is desirable because it does not extend past the limbs of the tree. Take a ¾ by 4 inch board and cut four pieces so that when nailed together they will form the desired outside dimensions of the base. If a 3 foot square frame is selected, cut two boards, 3 feet long and two boards 3 feet, 1½ inches long, to allow for overlapping at ends so they can be nailed together.

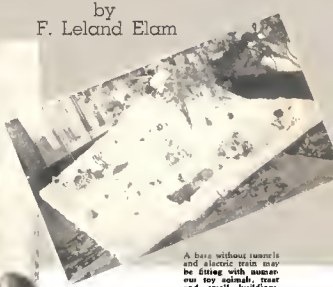
Cut another piece of lumber 3 feet long and mount it 1 foot in from one side of the frame. Another piece 1 foot long is nailed to the outside board and the inside board to form a 1 foot square opening in one corner.

This is to act as a base for nailing in the tree holder.

The tree holder is made of the same size board. Four pieces, each 1 foot long, are nailed edge to edge to form a holder with an almost square opening. This is fastened with nails to the inside intersection of the two boards which form the square in one corner.

The shape the stand will take, when the outer covering is mounted, depends upon how the built-up boards are mounted. Pieces of laths are best for this. To build the slopes up to the tree holder, fasten laths from the outside board to the top of the holder, at the back and on the sides, as desired. A board placed from the front corner, where the tree holder is mounted, to the opposite corner formed by the long inside board, is the base for nailing the lath which continues up to the tree holder.

Other laths nailed from the outside board to the board mounted crosswise provide a flat surface in front of the tree mount. If additional slope is wanted toward the tree holder or the outside edges, laths can be nailed from a lower board to ones sloping toward the holder.



A base without tunnels and electric train may be fitting with numerous toy animals, trees and small buildings.

When the stand is completed, life can be added to it by installing a toy train track on it. It is desirable to have the track extend into tunnels on opposite sides of the stand. The tunnels must, of course, be mounted before the plaster covering is applied. Form the tunnels by folding a piece of tin to the desired size and shape. A flat bend at either end will provide an edge for nailing to the board, which is mounted crosswise. The track is not mounted until later.

The next step is to take a piece of burlap, or sacks sewn together, and fit it to the stand. It should be large enough to allow for fitting into the design formed by

[*Continued on page 130*]

Tiny tots will thrill at the sight of a Christmas tree base such as this one. Construction is simple.

After determining the tunnel openings, dip the burlap in plaster of Paris, arrange it on the framework and build up low places with hands full of plaster as shown at left.

The short, chunky, deep-chested man should select a gun with a 13¼-in. stock, having a heel drop of 2½-in.

How To Select A Shotgun

by Robert Page Lincoln

Facts that every sportsman should know when he is buying a shotgun.

THERE is a belief, sometimes expressed, to the effect that certain individuals are able to pick up most any sort of shotgun, light or heavy, any gauge, and with varied length of stock, drop at heel, comb and pitch of barrel, and do as excellent work with it as any other gun. It would be logical to demand proof when such assertions are made. So far, it has been impossible to find a shotgun devotee who has been able to prove the conclusions just stated. The fact remains that if one wants to get the most out of a shotgun, it must be more or less carefully fitted to his requirements, physical and otherwise, else the results from the use of the weapon will be questionable in the extreme.

Comparatively few shotgun users have ever taken serious note of just how the gun they are using measures up to demands. If they are consistently missing game, blame is placed on the shells, the barrel, or the make of the gun. Some other gun and shells, they feel, would change things completely. Probably in some instances the gun and shells may be at fault, but not always. There are other things that must be considered. The stock of the gun and the drop at heel and comb must be taken into consideration when purchasing a gun. Unless your gun fits you in every way you cannot expect to go out and do worthwile shooting with it.

If all persons using a gun were built alike, guns could be made identical. But there are short men, tall, stout, medium and lean men; some with long arms and some with short arms. To believe that one certain cut of shotgun will do for all of these individuals is asking a great deal. Take the comb of the shotgun as an example. If the shotgun has a thick comb and the man shooting it is a person with jowls or outstanding cheeks, the tendency is invariably to throw the gun out of line, in which case the shot will go to the left. To bring the gun in line, such an individual must have a stock with a thin comb; in fact he may even have to have a special stock thinned down for him to suit his requirements before he will be able to do any real shooting. On the other hand, if the shooter has a thin or sunken cheek the direct opposite will be the case if a thin comb is used. He will shoot to the right. To remedy the situation he must have a thick stock to keep the gun in line. It is strange how little attention is ever given this matter of the proper stock. It is an adequate explanation for much poor shooting.

Another qualification rarely considered in

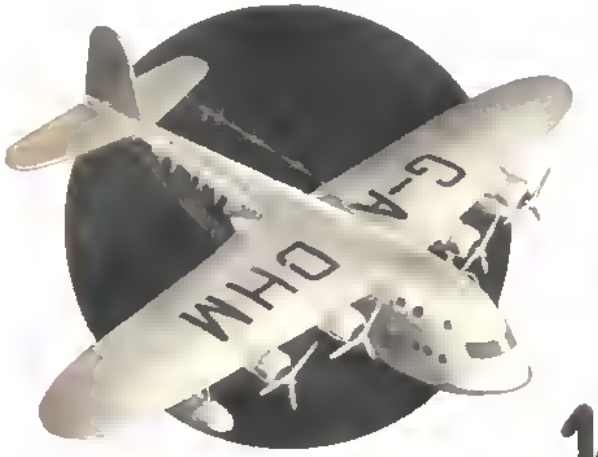
[*Continued on page 120*]

Because of increased muzzle blast heavy-load hunting guns require a longer barrel than guns of average load. Left—These upland hunters are equipped with guns having 28-inch barrels.

PITCH
By standing a gun against a perfectly vertical wall, the pitch, heel and comb drop can be quickly determined.
THE COMB, AND DROP AT NAME
STOCK IS MEASURED FOR LENGTH FROM TRIGGER TO CENTER OF BUTT OF STOCK
TOE OF STOCK
HEEL OF STOCK AND ITS DROP

For successful hunting a gun must be selected with care. The guns displayed by these hunters provides ample proof of this fact.

This hunter is using the popular pump-gun, which functions best with 28-inch barrel length.

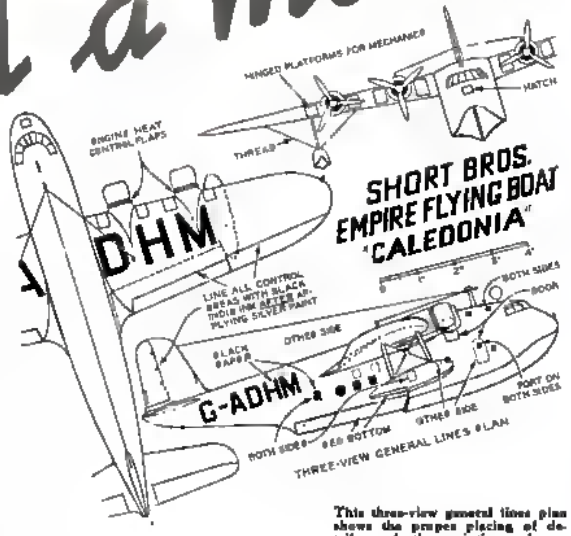


Facts About the "Caledonia"

In an effort to establish a trans-oceanic air service between England and the U. S., the "Caledonia" of Imperial Airways, made the final trip in 13 hours, 5 minutes. The return trip of 1,222 miles required only 12 hours, 5 minutes due to favorable winds. Before actual commercial flights are made, the "Caledonia" will be used to make several test crossings to check fuel consumption, meteorological and radio service.

This article tells you how to make a beautiful solid scale model of this new historic flying boat.

Build a Model



This three-view general lines plan shows the proper placing of details and the painting scheme. Body is finished in silver. Underside of the fuselage and the wing floats are lacquered in red.

by Nick Limber

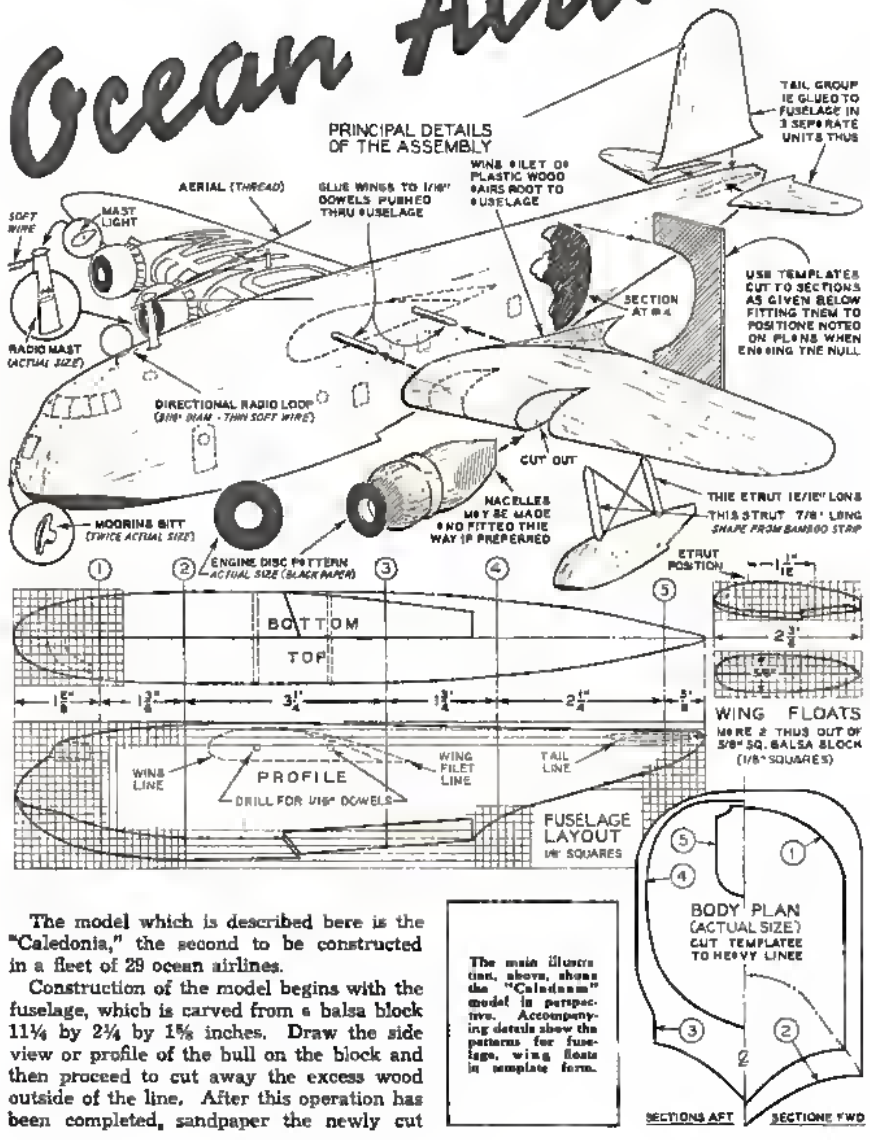
BRITAIN'S new sky liners have spanned the great Atlantic and have landed well ahead in the race to establish a trans-oceanic air service. This magnificent fleet of flying boats has brought the Dominion of Canada closer to the mother land than ever before and is now to be the final link between the old and the new continents.

Equipped with the latest of scientific devices, these winged clippers represent a golden harvest after 34 years of aeronautical research and experimentation. They are a triumph of aeronautical skill.

Built for Imperial Airways by Short Bros. Ltd., the boats have a wing span of 114 feet and an overall length of 88½ feet. They are powered with four Pegasus engines, similar to that used in the altitude-record holding Bristol 138A, and maintain a maximum speed of 200 m.p.h., cruising at 165 m.p.h. They are designed to accommodate 24 passengers as a day liner and 16 as a sleeper. Each ship is manned by a crew of 5, located in the upper deck of the two-deck hull. A promenade deck, salons, smoking lounge and model kitchen are located on the lower deck. Large windows, de luxe furnishings and a new technique in cabin design insure the passenger's maximum comfort and safety.

This solid scale model of the British "Caledonia" is an intriguing project for airplane enthusiasts.

Ocean Airliner


PRINCIPAL DETAILS OF THE ASSEMBLY
TAIL GROUP IS GLUED TO FUSELAGE IN 3 SEPARATE UNITS THUS
AERIAL (THREAD)
GLUE WINGS TO 1/16" DOWELS PUSHED THRU FUSELAGE
WING FILET OF PLASTIC WOOD AIRS ROOT TO FUSELAGE
SOFT WIRE
MAST LIGHT
SECTION AT #4
USE TEMPLATES CUT TO SECTIONS AS GIVEN BELOW FITTING THEM TO POSITIONS NOTED ON PLANS WHEN ENGRAVING THE HULL
RADIO MAST (ACTUAL SIZE)
DIRECTIONAL RADIO LOOP (3/16" DIAM. - THIN SOFT WIRE)
CUT OUT
MOORING FITT (TWICE ACTUAL SIZE)
NACELLES MAY BE MADE AND FITTED THIS WAY IF PREFERRED
THIS STRUT 1 5/16" LONG
THIS STRUT 7/8" LONG SHAPE FROM BAMBOO STRIP
ENGINE DISC PATTERN ACTUAL SIZE (BLACK PAPER)
STRUT POSITION
BOTTOM
TOP
WING FLOATS
MORE 2 THIS OUT OF 5/8" SQ. BALSA BLOCK (1/8" SQUARES)
WING LINE
PROFILE
DRILL FOR 1/16" DOWELS
WING FILET LINE
TAIL LINE
FUSELAGE LAYOUT 1/8" SQUARES
BODY PLAN (ACTUAL SIZE) CUT TEMPLATES TO HEAVY LINES
SECTIONS AFT
SECTIONS FWD

The model which is described here is the "Caledonia," the second to be constructed in a fleet of 29 ocean airlines.

Construction of the model begins with the fuselage, which is carved from a balsa block 11¼ by 2¼ by 1⅝ inches. Draw the side view or profile of the hull on the block and then proceed to cut away the excess wood outside of the line. After this operation has been completed, sandpaper the newly cut

The main illustration, above, shows the "Caledonia" model in perspective. Accompanying details show the patterns for fuselage, wing floats in template form.

MAGIC WITH MAGNETS

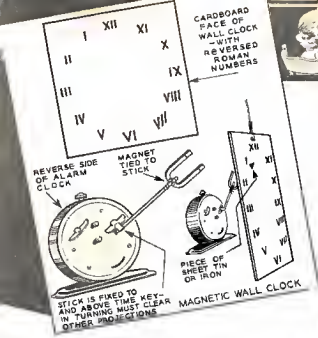
by Prof. Victor Lewitus

NEARLY everyone has either seen or heard about magnets, but very few people realize just how indispensable magnets of one form or another have become.

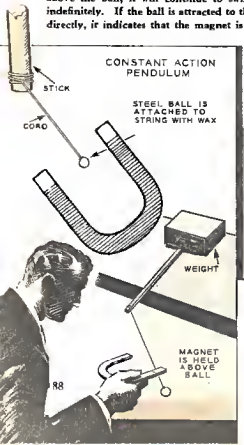
The Chinese people appear to have been the first to make use of the natural magnetic minerals which they found in certain regions, in great abundance. They discovered that the "lodestone," as it was called, was capable of attracting some things and not others.

As a result of these observations, man today has the advantages of the mariner's compass, the electric bell and buzzer, the magneto of automobiles, numerous railway signal devices, and many special surgical instruments. We must not forget to mention the telephone and the telegraph, nor should we forget that magnetism is the important factor in the production of electrical energy from the dynamo.

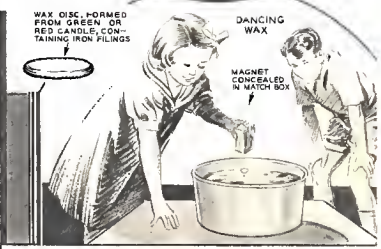
Our modern life is absolutely dependent upon the workings of magnetism. Without it we could not enjoy modern means of travel, be it on land or sea or far up in the clouds. Without it we could not communicate swiftly as we do from one end of the earth to the other. Without it we would be much discomforted.


CARDBOARD FACE OF WALL CLOCK WITH REVERSED ROMAN NUMERALS
REVERSE SIDE OF ALARM CLOCK
MAGNET TIED TO STICK
PIECE OF SHEET TIN OR IRON
STICK IS FIXED TO KEY AND ABOVE TIME KEY IN TURNING MUST CLEAR OTHER PROJECTIONS
MAGNETIC WALL CLOCK

MYSTERY WALL CLOCK—On a heavy sheet of square or round cardboard, place in a circle the numerals one to twelve, equidistant, and running counter clockwise. Attach a light stick to the winding key of an alarm clock. The stick should be as long as the radius of the circle around which the numerals were placed. Then attach a magnet to the end of the stick. The clock with its accompanying magnet should be placed close to the back of the clock face. A small piece of tin or iron will follow the magnet as it makes its hourly trip around the circle.



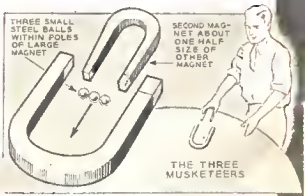
CONSTANT ACTION PENDULUM—To a small steel ball, attach by means of paraffin or candle wax a piece of ordinary thin cord. Attach the free end of the cord to the end of a stick which is supported over the edge of a table by a heavy object. While the ball is swinging freely, bring a strong magnet close to it, but not on the same level. With the magnet a short distance above the ball, it will continue to swing almost indefinitely. If the ball is attracted to the magnet directly, it indicates that the magnet is too close.



DANCING WAX—Melt some wax from a colored candle onto the surface of a pan of water, to form a small disc. Sprinkle the disc with iron filings and cover with more wax. With the disc floating on the water, bring a magnet close to it and watch the disc dance around on the water's surface. The trick is more impressive if the magnet is concealed in a small match box.

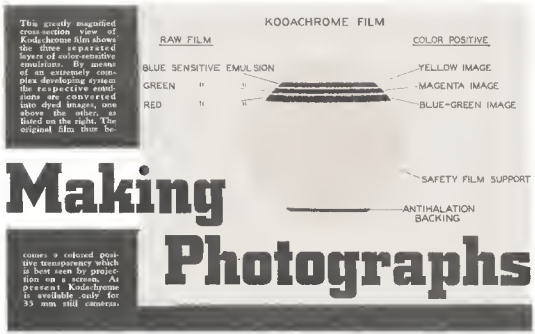
WATER COMPASS—Into a small vial or glass tube, place a small nail with the head toward the bottom of the vial. Cork it up and place it in a tumbler or pan of water. As the vial floats it is free to move in any direction. Then bring the magnet close to the vial but not touching it, and notice how it follows the magnet around the edge of the pan.

THE FEEDING CHICKEN—From a piece of stiff cardboard, cut the profile of a chicken, the size depending on the strength of the magnet to be used. To the side of the chicken that is away from the audience, attach a strong magnet by means of cord or thin wire. Place the magnet as close as possible to the mouth of the chicken without having it show. Using small ball bearings as feed, bend the chicken down close to the ground and notice how rapidly it "eats."

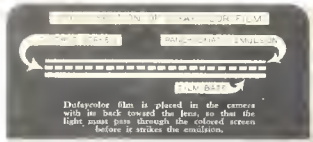

THREE SMALL STEEL BALLS WITHIN POLES OF LARGE MAGNET
SECOND MAGNET ABOUT ONE HALF SIZE OF OTHER MAGNET
THE THREE MUSKETEERS

THE THREE MUSKETEERS—Between the poles of a large magnet, place three ball bearings. Be sure that they are touching each other, and are as close to the center as possible. Then bring a magnet about half the size of the larger one between the poles of the latter, and towards the ball bearings. As the magnet approaches the three ball bearings, they will move backwards.

MAGNET BALLOON—Into a dark colored balloon, place a few pinches of iron filings or a small piece of steel wool. Then inflate the balloon and tie the end with a piece of cord or rubber-band. Place it on the table or floor and bring a magnet closeby. The balloon will rise rapidly off the table or floor to meet the magnet.


This greatly magnified cross-section view of Kodachrome film shows the three separated layers of color-sensitive emulsions. By means of an extremely complex developing system the respective emulsions are converted into dyed images, one above the other, as listed on the right. The original film thus becomes a colored positive transparency which is best seen by projection on a screen. At present Kodachrome is available only for 35 mm still cameras.
KOODACHROME FILM
RAW FILM
COLOR POSITIVE
BLUE SENSITIVE EMULSION
YELLOW IMAGE
GREEN "
MAGENTA IMAGE
RED "
BLUE-GREEN IMAGE
SAFETY FILM SUPPORT
ANTIHALATION BACKING

Making Photographs

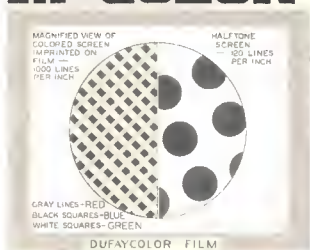

FILM BASE
Dufaycolor film is placed in the camera with its back toward the lens, so that the light must pass through the colored screen before it strikes the emulsion.

A small, simple projector provides the best means of showing color pictures. The images can be thrown up to large size on any white surface, and are spectacularly beautiful.

Easy to "shoot", color films open new opportunities for camera fans.

In COLOR

by Keith Henney


MAGNIFIED VIEW OF COLORED SCREEN IMPRINTED ON FILM — 1000 LINES PER INCH
HALFTONE SCREEN — 100 LINES PER INCH
GRAY LINES-RED
BLACK SQUARES-BLUE
WHITE SQUARES-GREEN
DUFAYCOLOR FILM

The screen pattern of Dufaycolor film consists of a patchwork of red, blue and green lines, so fine that there are 1,000 to the inch. They are imprinted on the film base by precision machines, and then covered over by a panchromatic emulsion, on which the image is actually recorded. A common 120-line halftone printing screen is shown for size comparison.

ALTHOUGH color photography for the amateur has been possible for many years, it is only recently that advantage has been taken of the several processes available. Advertisers have been conscious of the attention-getting value of color for some time; magazine editors have lately begun to use full-color photographs as cover illustrations and have been paying enormous sums of money ($500 to $1,000) for good "shots." Perhaps this increasing use of color photography in the graphic arts is what has focused the attention of the amateur on the fact that he, too, may take pictures in color.

The amateur may make two kinds of colored photographs: transparencies and prints on paper. A transparency is a film or plate which is exposed in a camera and then processed to give the colors of the original subject. It is like a lantern slide in that it is a positive and it is transparent. It must be viewed by bolding it up to a source of light or projected upon a screen in a lantern. It is like a motion picture positive except that it is in color and does not show motion. When one uses Kodachrome or Dufaycolor or one of the several color plates, he has, after processing, the original film or plate on which the exposure was made.

While it is perfectly easy to make good transparencies, it is still very difficult to make prints. Many amateurs are doing it, however. First it is necessary to make three exposures of the object on three films through three different filters. These are called separation negatives. Positives are made from each negative. These positives may be on other film or on special paper, and each must then be dyed, toned, or pigmented. The dyes or pigments used must be exactly related to the colors of the filters through which the negatives were made. The positives must be superimposed on one another in exact register. This means that the camera must not move during the negative-making process. For correct color balance in the final print, it is imperative that the three negatives be correctly exposed and developed. One cannot shoot with the abandon possible in making black and white prints.

Transparencies can be made almost as easily as shooting off black and white film, and they are marvelously beautiful to look at. They are so beautiful that many amateurs have foresworn black and white photography completely, have bought themselves a good projector and, instead of passing black and white prints among their friends to look at, entertain them with natural size images of their vacation spots, their babies, their pets or their bobbies, thrown on a screen.

Still photographers are therefore following the trend of movie makers. So beautiful are the color movies, and because of color so full of apparent depth—a sort of third dimension—that those who can afford it take nothing but color. Sales of color film have gone up over two thousand per cent in the last year!

There are several forms of color film available for the amateur. Dufaycolor has been available for several years both in cut film and in roll film for practically all cameras. Agfacolor plates have been on the market for years. Recently Eastman made available to owners of 35-mm still cameras its beautiful Kodachrome, which has done more to convert movie makers to color than any other factor.

All one has to do is load his camera, or his plate holders, with these materials and shoot it off—taking care that he observes the fact that these sensitive materials must be carefully exposed. They do not have the latitude of black and white; they must be correctly exposed if true color values are desired. One cannot go barging about shooting right and left with color! The amateur must know what he is doing.

Dufaycolor is an additive process in which true color values are secured by the light passing through an enormous number of minute colored filters embedded in the support on which the sensitive silver emulsion is placed. Dufaycolor can be processed at home, is good fun and not difficult. Anyone who develops his own black and white films can handle Dufaycolor, provided he is willing and capable of working in absolute darkness during the early part of the developing process. In this, Dufaycolor does not differ from the use of any highly sensitive panchromatic film. It must be developed by time and temperature and not by inspection—unless the materials are desensitized before development. Dufaycolor, however, will

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Polaroid Glasses Make Glareless Pictures

by Andrew Vena

POLAROID glasses, which cost only $3.75 as compared with regular Polaroid photographic screens costing from $12.00 to $27.00, provide an inexpensive means for experimenting with polarized-light photography.

These glasses, now generally available at optical stores, are designed to eliminate or reduce objectionable and blinding sun or headlight glare. With them, it is possible to see through and beyond a transparent glass surface or body of clear water without the glare or reflections ordinarily seen on the same surfaces. In the case of opaque reflective surfaces, objects placed on them will not show reflections when viewed through the Polaroid glasses.

Used on a camera, these glasses can eliminate unwanted glare and reflections from horizontal surfaces when held against the camera lens in a horizontal position. Vertical reflections, of course, require that the glasses be held over the camera lens in a vertical position.

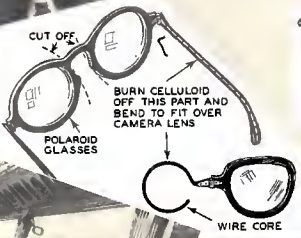
The accompanying photographs show different scenes, each taken twice; first without the Polaroid filter and then with it. Note that in the pictures taken with the filter all objectionable reflections are absent.

The illumination and the time of exposure were the same for each picture (1/25 second). A lens stop of *f*. 6.3 was used for all pictures taken with the Polaroid filter. A lens stop of *f*. 16 was used in taking the pictures that did not use the filter. It should be remembered that in all instances pictures taken with the filter should have a stop opening of four times that required for normal snapshots.

In taking pictures with the Polaroid filter, the glasses may simply be held before the lens, if the camera is mounted on a tripod or other stationary support. If a more permanent filter adapter is desired, the spectacles may be cut in half and the temple pieces bent to form a clip for attaching to the lens housing in the manner shown in the accompanying illustrations. A single pair of Polaroid spectacles will thus make two inexpensive filters.

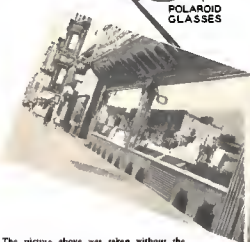
The amateur photographer should exercise care in using the filter so that when attached to the camera it is in either a perfectly vertical or horizontal position. If mounted at any other angle no light will pass through the filter or else it will not

[*Continued on page 122*]

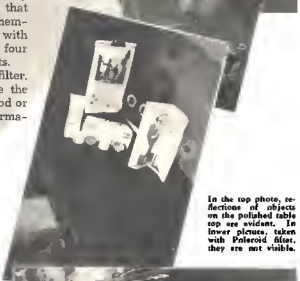


Polaroid spectacles can be made into permanent lens filters by cutting away the nose piece and hasting and bending the temple pieces to form lens clip as shown.

When attached to the camera lens, the Polaroid screen should be in either perfectly vertical or horizontal position.



The picture above was taken without the Polaroid filter. Note street reflection in store window. Right—Same scene taken with filter, but minus extraneous reflections and glare.

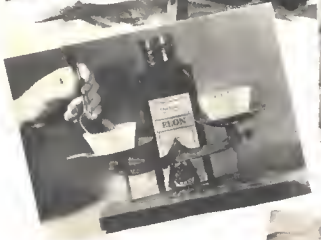


In the top photo, reflections of objects on the polished table top are evident. In lower picture, taken with Polaroid filter, they are not visible.

The effectiveness of the Polaroid spectacles in eliminating reflections and glare from snapshot pictures is made evident in these pictures. The picture at left was taken without the filter. The photo above, using the filter, shows no reflections. Always remember that the Polaroid filter must be mounted over the camera lens in a perfectly vertical or horizontal position. Otherwise, no image will be visible on negative when developed.

SHORT-CUTS FOR THE PHOTO FAN

by Kenneth Murray



Most useful accessories for weighing up photographic chemicals are these inexpensive paper pastry cups. Due to their crinkled shape, they will hold several ounces of sulphite or carbonate without spilling. The cups insure chemical cleanliness in the darkroom.

Where it is desired to stop motion, the normal maximum shutter speed of any good camera can be increased from 1 1/5 to 2 times by use of a rubber band. Loop band over the setting lever and attach the other end to wire finder in manner shown. Upper left—By lining inside of enlarger lamphouse with mirrors, printing time can be reduced 3/5.

Infrequently a photoflash bulb will burn when it is ignited, due to atmospheric changes or variations in the amounts of gas in the bulb. As a safeguard, slip a Cellophane bag over the bulb as shown at left. Right—A piece of tissue paper wrapped around a photoflash bulb makes an ideal diffuser.

Scratched miniature-camera negatives may be colorged without marks showing by applying a thin coating of Canadian balsam over negative and sandwiching it between two sheets of glass. Bind the edges of the glass with photographic tape.

Films may be washed in 1/3 the usual time with this funnel kink. Flatten a 5-in. diameter aluminum funnel, punch a small hole in the side and insert a push-pin for supporting the cut film. To use, connect funnel to water hose.

As white ink and pencil do not lend themselves well for titling snapshots in the photo album, adhesive titles are in be desired. These are made by typing the data on a sheet of adhesive or gummed paper and mounting under pictures.

This useful handle-grip accessory will greatly simplify picture taking. It is made from an old soldering iron handle, fitted with a bolt of the correct size to fit into the tripod socket on camera.

Gummed wafers for mounting prints in the photo album can be made by dipping thin sheets of paper in a thick solution of gum arabic and water. After allowing the sheets to dry, cut out wafers to the desired size.

Ordinary correspondence envelopes, punched and tied together as shown, make excellent files for negatives. Strips of adhesive tape provide reinforcement for the punched holes.

Gummed ring binder reinforcements permit a number of prints to be mounted on a single page of the photo album in file card fashion.

Photo Puzzlers

TAKING "MOONLIGHT" PICTURES IN DAYTIME

From time to time you have published prize winning pictures showing moonlight scenes which were actually taken during the daytime. I would appreciate more detailed information as to how I could take similar snapshots.—Ray Robbins, Houston, Texas.

There are two methods whereby moonlight effects can be obtained with daylight exposures. One consists of simply underexposing the negative so as to eliminate shadow detail and make the print quite dark. Usually pictures made in this manner are convincing only if the "moon" (in reality the sun) is included. The sun should be partially hidden behind clouds when making pictures of this kind. When the sun can be seen through the clouds without discomfort to the eyes, the conditions are good for such pictures.

The second method, which is of more general application, requires the use of a deep red filter over the camera lens. A Wratten filter No. 72 is suggested. The camera should be loaded with panchromatic film and the shutter speed advanced so as to partially underexpose the picture.

CAUSE FOR NEGATIVES PARTIALLY REVERSING

In developing a roll of film recently, I discovered that one of the exposures showed a partial positive image much like the images found on movie films. Was there something wrong with the film or did I err in the processing operation?—Dudley Willard, Milwaukee, Wis.

Considerable overexposure is sometimes the cause for the partial reversal of an image from a negative to a positive. More frequently it is caused by the film being exposed to light during the developing operation. When this occurs it is advisable to check the safelight for leaks, or look for cracks in the darkroom through which outside light may be entering.

Often reversals are caused by the safelight being placed too near the developing operation. Keep it a safe distance away from where you are working. Another, but uncommon, cause for films reversing is the presence of hypo in the developing solution. To avoid this, wash all trays well before and after using. If you will abide by the rules mentioned, future reversals will not be probable.

GREENISH-WHITE DEPOSIT COLLECTS ON FILMS

A number of my negatives show a greenish-blue deposit on the surface which does not seem to wash off. Can you tell me the cause of this and how it may be removed?—Edward Frankis, Flint, Mich.

The deposit on your negatives consists of aluminum sulphite and is caused by failure to keep the films moving after they were placed in the fixing bath. Usually the deposit can be removed by going over the negatives with a moistened viscose sponge or wet absorbent cotton before they have had a chance to dry. Once the films have dried the deposit can only be removed by treating them with a 5 percent solution of sodium carbonate at 80° F. To prevent damage from softening the emulsion, the films should first be hardened with a 10 percent formalin solution.

OBTAINING GOOD BLACK TONES ON PRINTS

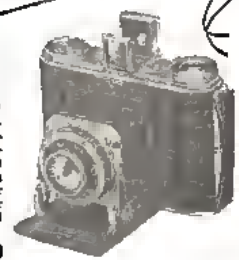
I have experienced some difficulty in obtaining good black tones on my prints. Probably the trouble is due to my lack of knowledge in developing the printing paper, therefore suggestions would be appreciated.—Carl Dare, Portsmouth, Va.

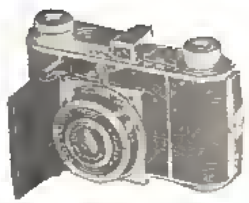
In order that good dark tones are obtained on prints it is advisable to follow out the exact developing formula recommended by the manufacturers, using only the quantity of bromide necessary to keep the margins of the print clear. The temperature of the developing solution should be 70° F. Expose the print so that it will develop out in from 1 to 1½ minutes. Good results can only be had by complete developing, using, of course, fresh chemicals. A frequent unrecognized source of poor tones on developing-out-paper is contamination of the developer with hypo. A very small trace of hypo in the developer is sufficient to effect the color of the print, making it impossible to produce rich black tones.

PREVIEW of Miniature Kodaks

KODAK DUO SIX-20, SERIES II *(right)* New, improved—the "miniature" that takes album-size pictures (1⅝x2½). Kodak Anastigmat *f*.3.5 lens; 1/500-second Compur-Rapid shutter, Sunshine release on camera body. Bracket for range finder. Single-finger lens release. Die-cast metal body. Price remains

$57.50





KODAK RANTAM SPECIAL *(below)* Performs brilliantly under all conditions. Lens, Kodak Anastigmat EKTAR *f*.3.5. 1/250 Compur-Rapid shutter. Coupled range finder, military-type, split-field. Negatives are needle-sharp, yield superb enlargements. Also makes full-color transparencies on Kodachrome Film. Price

$110

KODAK KETINA *(above)* Lens, Kodak Anastigmat EKTAK *f*.3.5. 1/295 Compur-Rapid shutter. For black-and-white pictures: Kodak "35," Panatomic, Super X, Infra-Red Film. For full-color transparencies: Kodachrome Film. (Negatives approximately 1 x 1½ inches.) Film-measuring device. Exposure counter. Price

$57.50

Brownie-from $5; Kodak-from $5. See them at your dealer's . . . Eastman Kodak Company, Rochester, N. Y.

ONLY EASTMAN MAKES THE KODAK

KODACHROME FILM FOR FULL-COLOR "STILLS"

Load with Kodachrome and get full-color transparencies to be viewed as they are, or mounted for large-size projection. Easy on black-and-white. No. K828 or K828A (8 exp.) for Kodak Rantam Special. $1.35; No. K135 or K135A (16 exp.) for Kodak Retina and similar cameras, $2.50. Prices include processing.

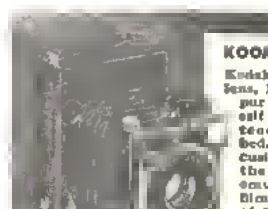
your Kodak dealer's Christmas suggestions...

Precision Kodaks

KODAK SENIOR SIX-20 (*f*.4.5)

Kodak Anastigmat *f*.4.5 lens; 1/200 Kodamatic shutter. Body shutter release minimizes camera movement. Optical, direct-view finder helps you get the picture when it's exactly right. 2¼x2¼-inch pictures. Price

$29.50



KODAK RECOMAR 18

Kodak Anastigmat 1:4.5 lens, 1/250-second Compur shutter. Built-in self timer. Double-extension bellows and bed. Ground-glass focusing back. Utilizes the almost limitless emulsion available in film packs, cut film and plates. Pictures, 2¼ x 3¼ inches. Price

$54

Ciné-Kodaks

CINÉ-KODAK EIGHT *(right)* Movies at only "16 cents a shot." Ciné-Kodak Eight makes it possible. A roll of Ciné-Kodak Eight Panchromatic Film costs you only $3.25, *finished, ready to show.* Good for from 20 to 30 black-and-white movie "shots," each of newsreel length. Price

$34.50

$48.50

CINÉ-KODAK "E" *(left)* An Kassnar 16 mm. movie camera at the lowest price ever. Kodak Anastigmat *f*.3.5 lens. Fixed focus. Triple-speed device. Simplified gate enormously facilitates loading. Takes all 50- or 100-foot 16 mm. Ciné-Kodak Films. Price, $48.50.

CINÉ-KODAK "K" *(right)* World's most widely used 16 mm. home movie camera. Makes clear, brilliant movies at the touch of a lever. Performs beautifully for the beginner, and as his skill increases, responds to every exacting demand. Loads with full 100 feet of 16 mm. film. With *f*.1.9 lens.

$88.50

Including carrying case, $1.00.

KODACHROME FILM FOR FULL-COLOR MOVIES

Loaded with Kodachrome Film, all Ciné-Kodaks make gorgeous full-color movies. They are easy to make as black-and-white. No extra equipment; the color is in the film. Here are beauty and realism impossible to describe. The projection of Kodachrome is thoroughly trouble-free. You can splice color sequences right in with black-and-white. See a Kodachrome reel at your dealer's. 16 mm. cameras load with 100-foot rolls at $9, 50-foot rolls at $4.75, 50-foot magazines at $5. Rolls for Ciné-Kodak Eight cost $3.75. Prices include processing.

$125

MAGAZINE CINÉ-KODAK *(left)* Loads in three seconds. You don't touch the film at all—it comes to a magazine. Just slip the magazine into place, close the camera cover and you're ready to shoot. To switch from one film to another, you merely take out a partly used magazine, slip in one of the six new features in this remarkable pocket-size movie camera. Equipped with fast *f*.1.9 lens, $125; including combination carrying case, $137.50.